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Mica
Insulator
Company.

New York.
Chicago.
London, Eng.



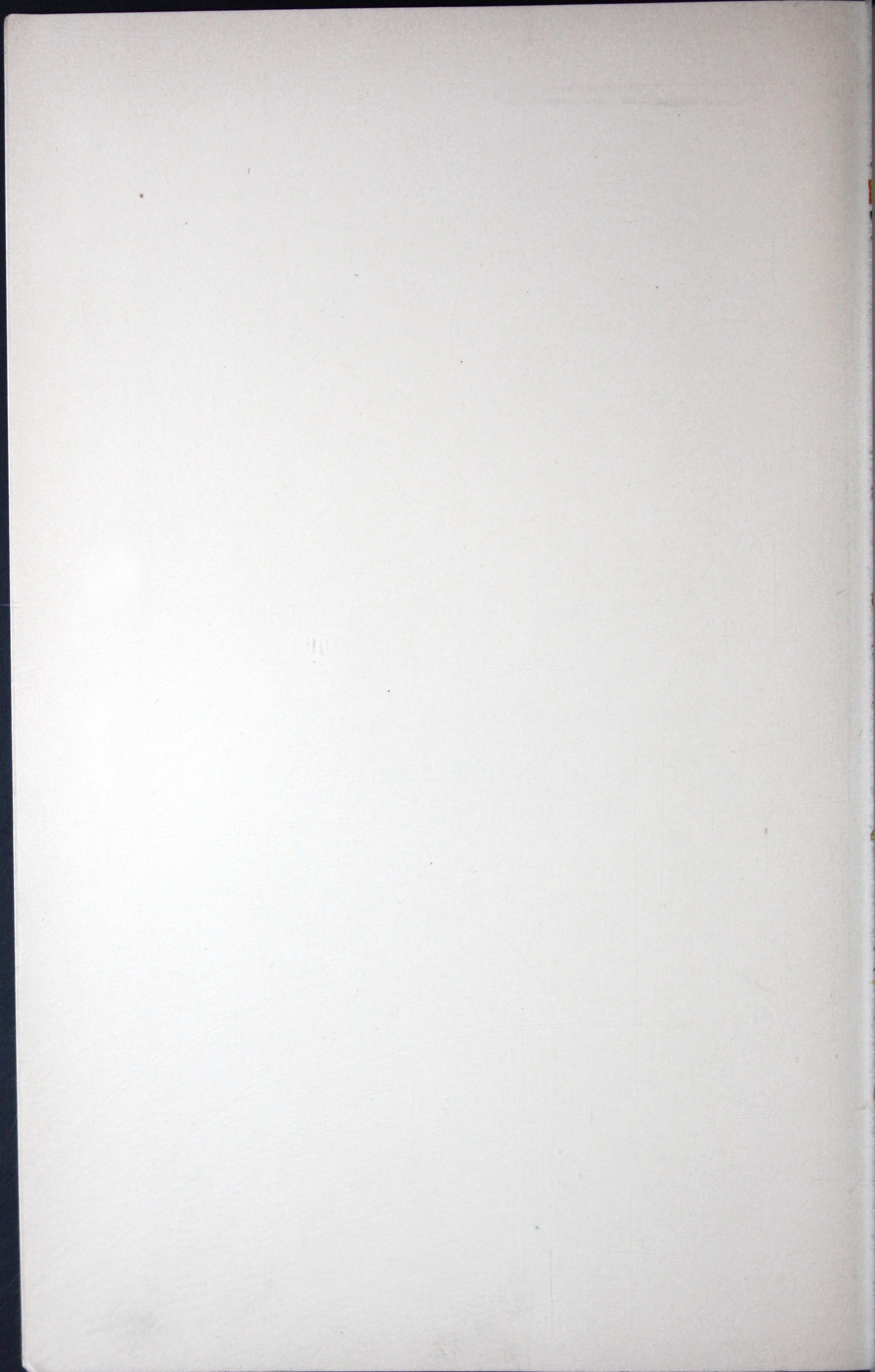
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TO ALL
PROGRESSIVE ELECTRICAL ENGINEERS
INTERESTED IN THE
GREAT IMPROVEMENTS MADE IN ELECTRIC INSULATION
THIS CATALOGUE IS RESPECTFULLY DEDICATED



MICA INSULATOR CO.

Main Office - 218 Water St., New York, N.Y.

Western Office 117 Lake Street, Chicago, Ill.

European Office 12 Camomile St., London, Eng.



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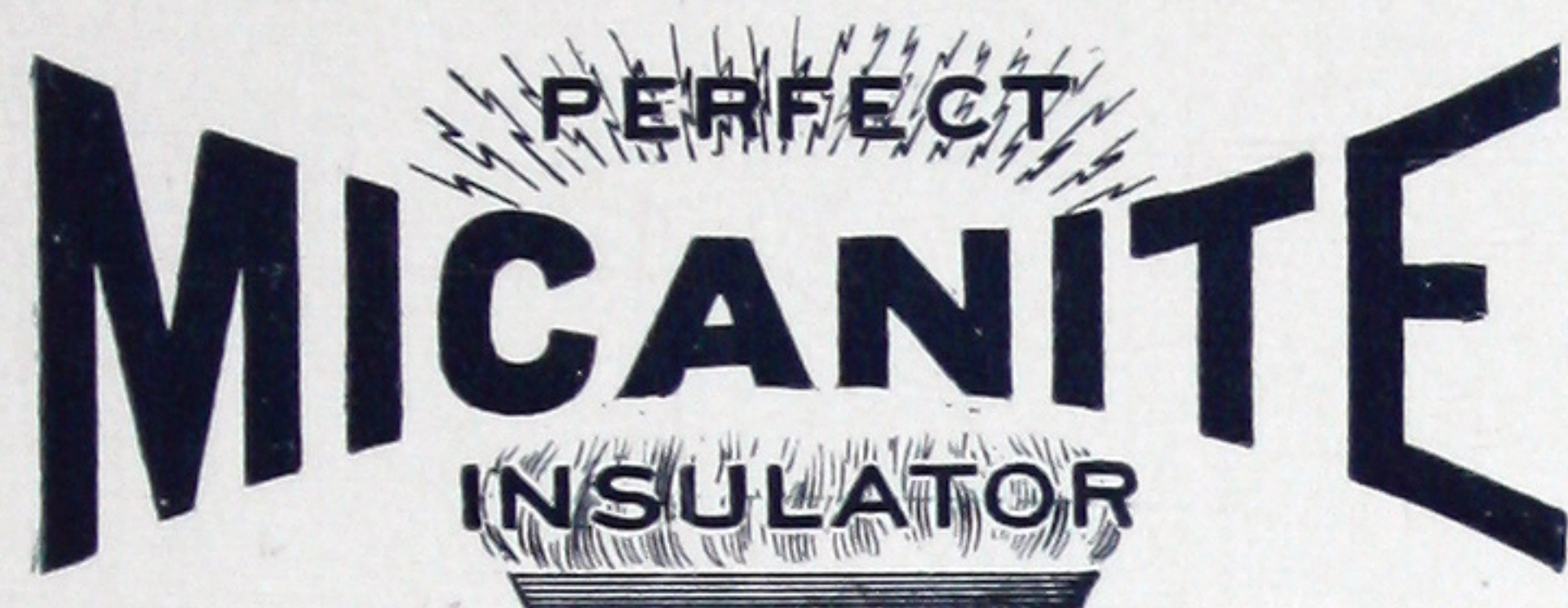
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TO OUR CUSTOMERS.

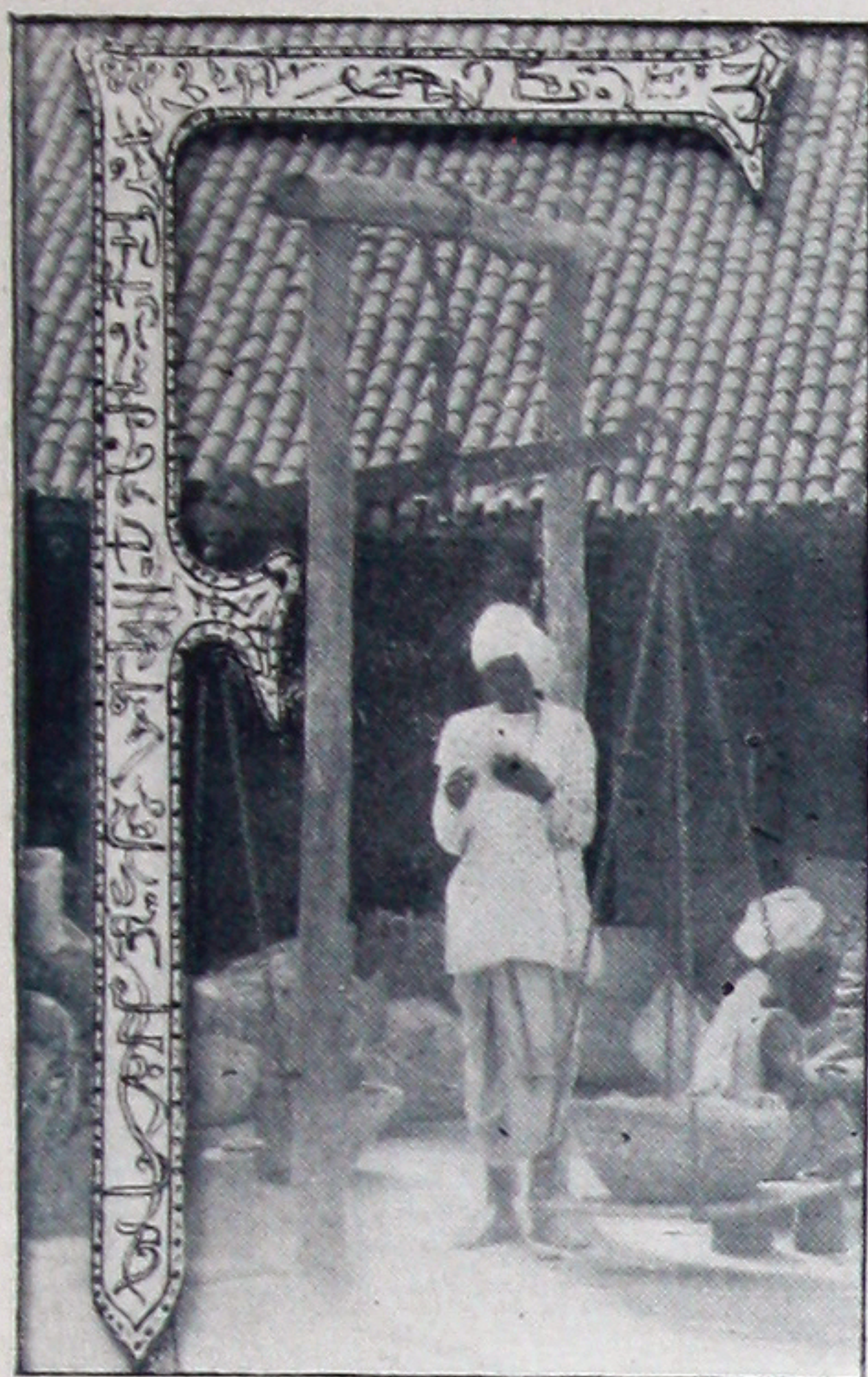
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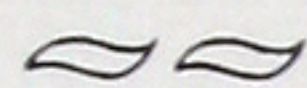


AND OTHER
INSULATORS



NATIVE WEIGHING OUT OUR
ORDERS.

INDIA MICA.



FROM the mines of India the world has been supplied for centuries with Mica, it being the only transparent sheet known to the arts before the production of glass plate. Probably the most extensive use of Mica, in India, is for ornamental purposes, either in its natural state or artificially colored. In the days of ancient Rome the powdered material was scattered over the surface of the amphitheater to obtain a brilliant glistening effect. In India it is used at native festivals, marriages and in the Mohammedan Maharan for processional ornaments, as

lamps and tinsel decorations, on banners, on fans, in temples, palaces, etc. The Mica powder is used for ornamental pottery, on curtains and cloths, and and in calico printing and by the dhobi (washerman) to give a sparkle to cloth to which the fine particles adhere. The natives sell large numbers of pictures and portraits painted on Mica sheets of various sizes. Thales knew of these Mica deposits in India and allusion has been made to them in the Koran.

The lanterns used by Columbus on his first voyage were protected by Mica, probably from these mines.

Mention may be made of the use of Mica for ornamental purposes by the aborigines of America, where it has been found in the graves of ancient tribes of Indians, in localities which would indicate a certain amount of commercial intercourse amongst widely separated tribes.

The Mica mines of India are near the interior and very inaccessible. The only American mica miner who ever visited these mines was our Mr. Franklin Brooks, and what he saw there was an interesting revelation of antiquity, both from an engineer's and miner's point of view.

The mine which is known as the "Abruker Mine," produces the finest Mica that has ever been mined, both for lamination and color. The mine in question has been sunk about two hundred feet, following the pitch of the vein, and all this Mica and refuse has been raised and carried away by the natives. No machinery of any kind, except drill and hammers, is used in their mining operations. The refuse and the Mica are placed in baskets, which hold about ten pounds, and are passed up from hand to hand by the women who stand in a line on the ladders. When the top is reached the baskets are dumped and returned down the ladder in the same manner, but by another line of women. Water is taken out by jugs. Plate 1 shows the women at work, and also another ladder which is provided for the miners to enter the mines.

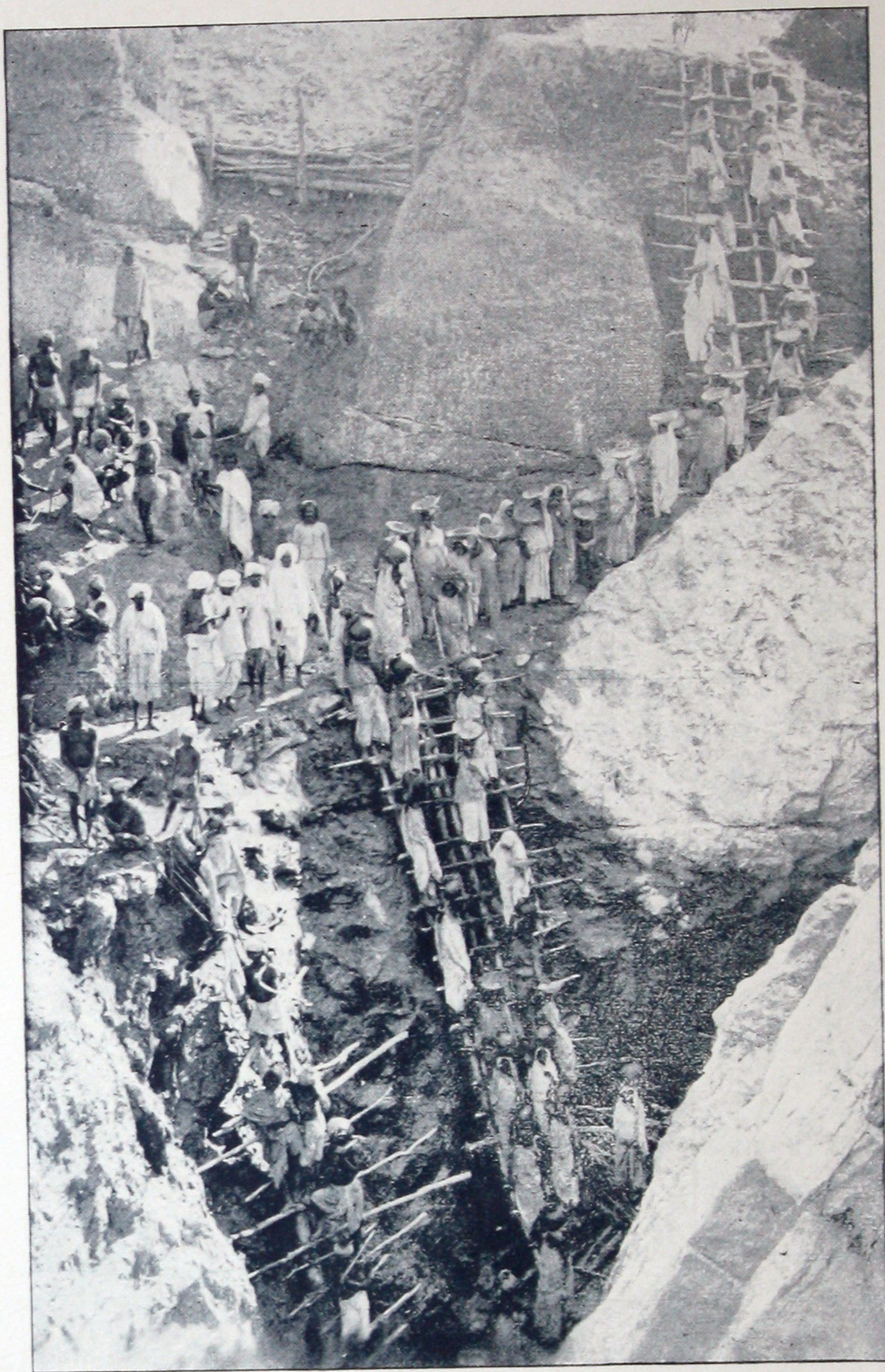


PLATE 1.

There is no reason to believe that there has been any change in this method of operation for many hundred years, except that there is more care taken to protect the miners.

After the crude Mica is taken from the mines, it is first roughly trimmed and then sorted into different grades, according to sizes and quality. It is then taken to the Mica workers, who split it up and scribe out the size for it to be cut into by the shearers. Then the cut pieces are cleaned, weighed and packed ready for shipment.



PLATE 2.

Plate 2 shows the Mica workers cutting and packing. The Mica is sent to the general storehouse in baskets, on the backs of bullocks and in bullock carts, as shown in Plate 3.



PLATE 3.

The prepared Mica is loaded in carts, drawn by bullocks, and carried in this way hundreds of miles to shipping points at the speed of about ten miles a day. See Plate 4.

Plate 5 is the native mine owner's bungalow.

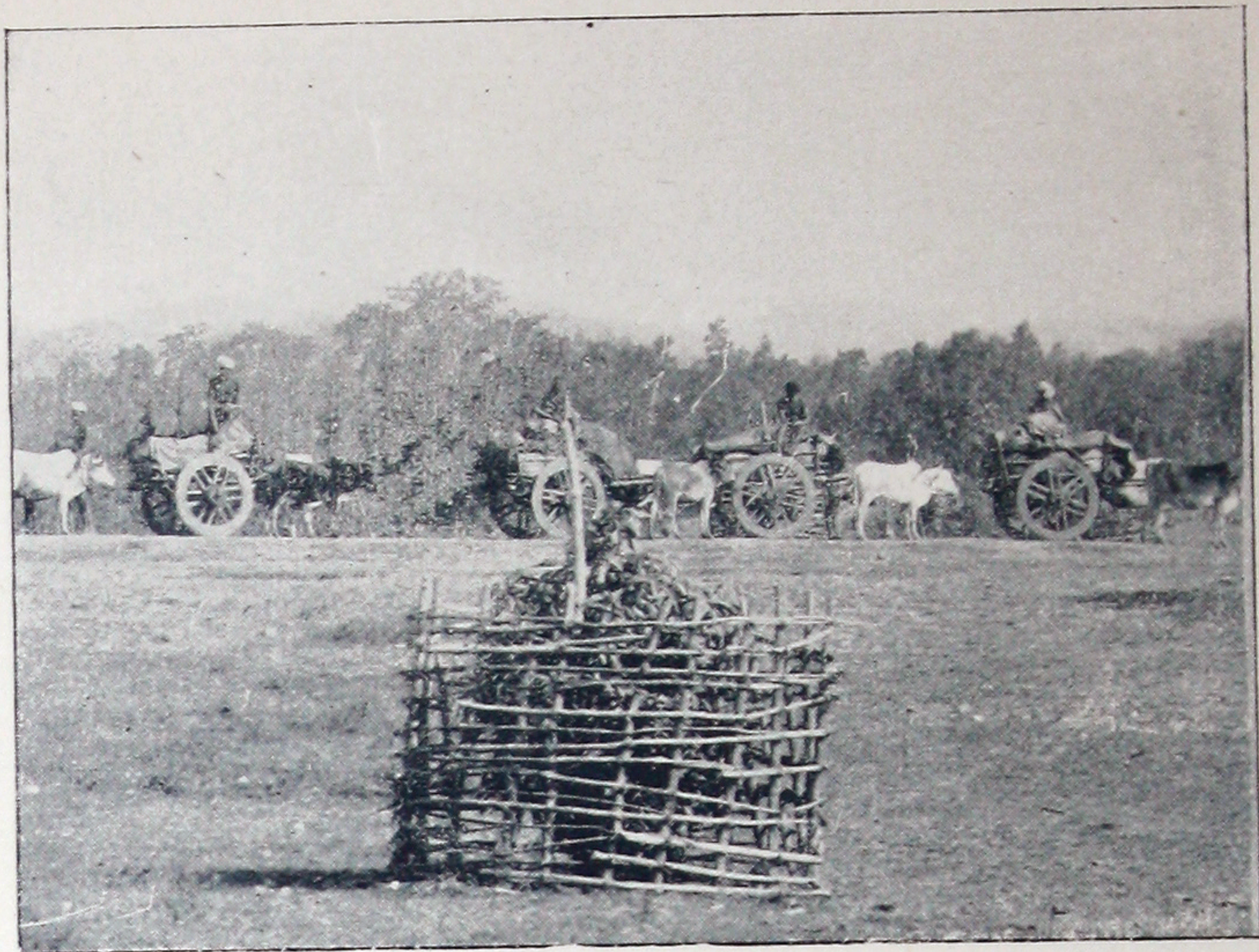


PLATE 4.

Mica, or Muscovite, its geological name, in nature is formed in pockets, where it is crystallized in large sheets.

Sheets under 2" x 2" are of little commercial value.

The occurrences of these pockets cannot be predicted by the geological formation; this makes it one of the most hazardous forms of mining, and for this reason a great number of mines have actually cost more to mine than the Mica produced could be sold for.

Mica is an anhydrous silicate of calcium and aluminum, and crystallizes in a laminated mass easily split along its axis and can be subdivided down to $\frac{3}{10000}$ of an inch of thickness.

Mica, being both fire-proof and transparent, makes it useful for many other purposes in the arts, besides that of an insulator.



PLATE 5.

MICANITE.

Two requirements of an insulator of universal adaptability, should be elasticity and flexibility and these qualities are not found in any of the natural Mica formations, nor does it permit of being readily worked with tools in its natural state. But Mica is fire-proof and its insulating qualities are unaffected by time.

By splitting up the Mica into laminæ and re-assembling these thin sheets and solidifying them by use of a highly insulating cement, by the application of high pressures and temperatures, the manufactured Micanite is made perfectly homogeneous.

The improvements effected by this relamination, are: to increase the insulating properties over any sheet of natural Mica, which varies greatly for different parts of one sheet. but by splitting up the Mica and re-assembling, the insulating qualities of the Mica are greatly improved by averaging up.

See Table No. 1 for actual relative improvement as an insulating material.

Natural Mica has the different laminæ immediately adhering to each other, and does not allow of the moving of these different sheets, which is required in order to bend the Mica without fracture.

The function of the cement is such that, when heated, it allows the different planes of the laminated Mica to slip by each other, and in this way to allow the Mica to conform, while heated, to any surface to which it may be applied, and if allowed to cool, in a die, it will remain in a rigid position and so dense as to emit a metallic ring when struck.

Any insulator of a fibrous or cellulose nature will change greatly in resistance under time tests, being naturally hygroscopic and absorbing moisture from the adjacent air. This is very noticeable in tests of time on fibre and wood. The samples tested, as shown in Table No. 3, were English vulcanized fibre and it clearly shows that such insulators should be protected from moisture.

Micanite in its manufacture has introduced into it a material in the form of cement, which absolutely excludes all moisture and is impervious to water.

Table No. 1 also gives the insulation of Micanite and other insulators per cubic centimeter and per cubic inch and Table No. 2 gives the potential necessary to break down the different thicknesses of insulators.

It will be seen from the tests that Micanite possesses a high degree of insulation, which combined with its mechanical rigidity and non-absorbent and fire-proof qualities at normal temperatures, and the facility by which it can be formed at high temperatures, its property to maintain its insulation under exposure, have made Micanite as perfect an insulator as can be desired, and as all electrical apparatus and appliances depend for their proper operation upon keeping the electric currents which circulate in them within the proper limits by surrounding the conductors with insulation, the whole function of the machine or appliance is dependent upon the insulating qualities of the insulator used. A better insulator increases the reliability and decreases the repairs of these appliances, and the recent advances in the art of insulation have been due to Micanite.

PHYSICAL PROPERTIES OF AN INSULATOR.

The physical properties of an insulator are such that with a rise in temperature the insulator falls in resistance. This is more marked with organic and simple insulators. The composite insulators are less affected by temperature changes. With an increase in measuring potential an insulator gives lower insulating values, and the converse is true. To break down an insulator apply to it gradually increasing potentials until the difference becomes so great that the current actually pierces through the material to the opposite measuring plate. Insulators also show very marked fatigue under continued application of high electrical potentials, and will break down for lower potentials, if applied for a length of time, than that required to rupture it by a momentary application.

As a rule, mechanical combinations of dissimilar insulators offer greater resistance to potential stress than either single insulator. An insulator used under pressure has its ability to resist rupture reduced. This is especially true where the insulators contain traces of metallic salts. Insulators containing cellulose, or vegetable matter, are disintegrated and changed into carbon by the continuous application of temperatures of about 150 degrees centigrade. The presence of vegetable oils greatly accelerate the carbonization of the fibre, and as soon as an insulator is carbonized it has lost all properties of insulation and becomes a conducting medium. A rapidly alternating potential is more severe on insulation than an equivalent continuous potential. This is partly due to heating from dielectric hysteresis.

TABLE No 1.

Material.	Insulation in Megohms per Cubic Centimeter.	Insulation in Megohms per Cubic Inch.	Temp.
Benzine	14×10^6	5.22×10^6	
Distilled Water.....	7	2.66	
Ebonite	$28000 \times "$	$1103 \times "$	46 Deg. C.
Glass, Flint.....	$20000 \times "$	$788 \times "$	20 " C.
Glass, Ordinary.....	$91 \times "$	$3.59 \times "$	20 " C.
Gutta Percha.....	$450 \times "$	$177 \times "$	24 " C.
Ice.....	2240	882	
Mica	$84 \times "$	$33 \times "$	20 " C.
Micanite.....	$2490 \times "$	$981 \times "$	
Micanite Cloth.....	$310 \times "$	$122 \times "$	
Micanite Paper	$1240 \times "$	$488 \times "$	30 " C.
Oil Asbestos.....	850×10^3	315×10^3	
Olive Oil.....	1×10^6	0.394×10^6	
Paper, Parchment	$0.03 \times "$	$0.112 \times "$	20 " C.
Paper, Ordinary	$0.0485 \times "$	$191 \times "$	20 " C.
Paraffine.....	$24000 \times "$	$13396 \times "$	46 " C.
Sea Water.....	30 Ohms	11.8 Ohms	
Shellac ...	9000×10^6	3546×10^6	28 " C.
Vulcanized Fibre, Black	$68 \times "$	$26.8 \times "$	
Vulcanized Fibre, Red..	$10 \times "$	$3.9 \times "$	
Vulcanized Fibre, White	$14 \times "$	$5.5 \times "$	
Wood, Ordinary.....	$572 \times "$	$225 \times "$	
Wood, Paraffined.....	$3690 \times "$	$1453 \times "$	
Wood, Tar.....	$1670 \times "$	$658 \times "$	
Wood, Walnut	$53 \times "$	$20.8 \times "$	

TABLE No. 2.

Breaking down voltage per thousandth of an inch thickness ; cold.

Material.		Observer.
Single Cotton Covered Magnet Wire.....	289.5	Canfield
Double " " " "	205.	and Robinson
Single Silk " " " "	565.	Do.
Double " " " "	412.	Do.
Single Cotton Covered Heated with Shellac	369.	Do.
Double " " " " " "	297.	Do.
Single Silk " " " " " "	534.	Do.
Double " " " " " "	511.	Do.
Single Cotton " with Paraffine.....	337.	Do.
White Bristol Board.....	240.	Do.
Red Fibre.....	307.	Do.
Black Fibre.....	101.	Do.
Red Press Board.....	405.	Do.
Vulcabeston	76.	Do.
Micanite Plate....	1012.	Herrick and
Micanite Cloth	439.	Burke.
Empire Cloth No. 1.....	506.	Do.
Micanite Paper.....	467.	Do.
Oiled Asbestos	320.	Do.
Oiled Muslin	355.	Do.

TABLE No. 3.

Specific Resistance (at 15 Deg. C.) per Cubic Centimeter.

By	Dry.	Exposed 24 Hours.	Exposed Several Months.
Eugene Muller Berne.	A.	B.	C.
1 White Vulcanized Fibre	2,500 x 10 ⁶ L	200 x 10 ⁶ L	14 x 10 ⁶ L
2 Light Brown Fibre	7,400 x "	580 x "	18 x "
3 Red " "	16,500 x "	245 x "	10 x "
4 Black " "	20,500 x "	2,000 x "	68 x "
5 Red " "	35,400 x "	3,250 x "	54 x "
6 Ordinary Walnut Wood Fibre	99,000 x "	2,870 x "	53 x "
7 Ordinary Wood "	49,500 x "	21,000 x "	572 x "
8 Paraffined "		620,000 x 10 ⁷	3,690 x "
9 " "		185,000 x 10 ⁶	11,080 x "

TABLE No. 4.

Number of Commu- tator Segments.	Number Deg. Arc per Segment.	Const. X. D. Width of Segment N. No. of Seg.	Number of Commu- tator Segments.	Number Deg. Arc per Segment.	Const. X. D. Width of Segment N. No. of Seg.
20	18. Deg.	.1571	138	2.6 Deg.	.0228
22	16. "	.1428	140	2.55 "	.0224
24	15. "	.1309	144	2.5 "	.0218
28	13. "	.1122	148	2.43 "	.0212
30	12. "	.1047	150	2.4 "	.0209
36	10. "	.0873	154	2.3 "	.0204
40	9. "	.0785	158	2.28 "	.0198
42	8.6 "	.0748	160	2.25 "	.0196
46	7.8 "	.0683	164	2.19 "	.0191
48	7.5 "	.0654	168	2.15 "	.0187
54	6.6 "	.0581	170	2.12 "	.0185
58	6.2 "	.0541	174	2.07 "	.0181
60	6.0 "	.0523	178	2.03 "	.0176
62	5.8 "	.0506	180	2.0 "	.0174
64	5.6 "	.0491	184	1.95 "	.0171
66	5.5 "	.0476	188	1.9 "	.0167
68	5.3 "	.0462	190	1.89 "	.0165
70	5.1 "	.0448	194	1.85 "	.0162
72	5. "	.0436	198	1.82 "	.0158
74	4.8 "	.0424	200	1.8 "	.0157
76	4.7 "	.0413	204	1.76 "	.0154
78	4.6 "	.0403	208	1.73 "	.0151
80	4.5 "	.0393	210	1.71 "	.0149
84	4.3 "	.0374	216	1.66 "	.0145
88	4.1 "	.0357	220	1.64 "	.0143
92	3.9 "	.0341	224	1.6 "	.0140
96	3.7 "	.0327	228	1.58 "	.0138
100	3.6 "	.0314	230	1.56 "	.0137
108	3.3 "	.0291	234	1.54 "	.0134
112	3.2 "	.0280	236	1.52 "	.0133
116	3.1 "	.0271	238	1.51 "	.0132
120	3.0 "	.0262	240	1.5 "	.0131
124	2.9 "	.0253	244	1.47 "	.0129
128	2.8 "	.0245	248	1.45 "	.0127
132	2.7 "	.0238	250	1.44 "	.0126
136	2.65 "	.0231			

ARMATURE NOTES.

The cross section allowed per ampere in copper armature conductors, in the old Western machines, was from three hundred and seventy to five hundred and sixty square mils per ampere. Edison Bipolar machines from four hundred to five hundred square mils per ampere, for single wire and for wires used in multiple, from five hundred and seventy-five to six hundred square mils per ampere. Thompson gives three hundred and thirty to five hundred square mils per ampere for ring armatures.

To figure the number of wires that can be wound across a given slot, or laid around the circumference of a drum after insulation is applied, divide the diameter of the wire, on Table No. 5, which is the diameter over the insulation of double cotton covered B. & S. wire, into the space to be filled; this will give the number of turns per layer; divide the depth to be wound by the same diameter and it will give the layers and both results multiplied together will give the number of turns per slot.

TABLE No. 5.

Size B. & S. Bare Copper.	Max. Diam. of D. C. C. Wire.	Turns per Inch.	T. Turns per Square Inch	H. Resistance per Cubic Inches, Intern. (Ohms) 20° C.
5	.197	5.0761	25.7668	.0006725
6	.177	5.6497	31.9191	.0010502
7	.159	6.2893	39.5555	.0016377
8	.143	6.9930	48.9020	.0025575
9	.129	7.7519	60.2305	.0039601
10	.117	8.5740	78.0512	.0060705
11	.106	9.4339	88.9985	.0093448
12	.093	10.7527	115.6205	.0152619
13	.084	12.0482	145.1591	.0240964
14	.075	13.3333	177.7777	.0373333
15	.067	14.9254	222.7674	.0590334
16	.061	16.3934	268.7435	.0895991
17	.055	18.1818	330.5782	.139173
18	.050	20.0000	400.0000	.212400
19	.046	21.7396	473.4760	.317229
20	.042	23.8095	566.8924	.479024
21	.038	26.3158	692.5214	.737535
22	.035	28.5714	876.3250	1.096324
23	.033	30.3030	918.2718	1.554637
24	.030	33.3333	1,111.1111	2.373333
25	.028	35.7270	1,276.4100	3.436108
26	.026	38.4615	1,479.2870	5.022182

The above table is the maximum diameter D. C. C. made by three manufacturers.

MICANITE PLATES.

(PATENTED.)

Micanite Plate can be milled, stamped, drilled and sawed to any pattern, and adapts itself with the assistance of heat to most forms required for an insulator.

It is made in such thicknesses as to resist any voltage. Metal spools for fields can be covered with it, and armature cores, shafts and slots, commutator segments, transformer insulators, influence machine discs and rings of all shapes and sizes can be formed out of it. Micanite plate can be delivered to any uniform thickness, and in area any size up to forty-two inches square.

There are two kinds of plate.

No. 1 STANDARD.

Suitable for general purposes.

This plate softens when heated, and is easily moulded to form.

No. 2 SPECIAL.

Made especially for commutator segments.

The cement in this plate will not ooze when heated.

The Mica is softened and wears away equally with the copper bars of a commutator.

This plate will be made of Amber Mica when so desired.



MICANITE PLATES.

Standard sizes of No. 1 and No. 2 kept in stock made with selected India Sheet Mica.

Size.	Thickness.	Size.	Thickness.
18 x 36	$\frac{10}{1000}$	18 x 36	$\frac{50}{1000}$
" "	$\frac{15}{1000}$	" "	$\frac{55}{1000}$
" "	$\frac{20}{1000}$	" "	$\frac{60}{1000}$
" "	$\frac{25}{1000}$	" "	$\frac{65}{1000}$
" "	$\frac{30}{1000}$	" "	$\frac{70}{1000}$
" "	$\frac{35}{1000}$	" "	$\frac{75}{1000}$
" "	$\frac{40}{1000}$	" "	$\frac{100}{1000}$
" "	$\frac{45}{1000}$	" "	$\frac{125}{1000}$

Other thicknesses and sizes made to order.

We ask our customers particularly to designate No. 2 plate if that kind is required, otherwise No. 1 standard will be sent.

No. 1 plates 18" x 36" weigh approx. .86 of an ounce per mill of thickness.

No. 2 plates 18" x 36" weigh approx. .81 of an ounce per mill of thickness.

FLEXIBLE MICANITE PLATE.

STYLE "A".

(PATENTED.)

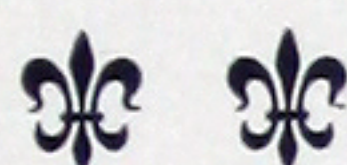
Sheets 32 inches square, any thickness from $\frac{10}{1000}$ up.

This material, though more costly than the style B plate, and of the same insulating value has the advantage of being a better stock keeper. It will remain in the same degree of flexibility for years, and whenever warmed its flexibility is still further increased, and is handled like a piece of muslin.

It is similar to the Extra Flexible Micanite Cloth without the addition of paper or muslin.

It is absolutely non-absorptive.

It is used for insulating armature slots, and coils, armature and field magnet cores, and whenever a Sheet Mica Insulator is preferable to paper or fabric.



FLEXIBLE MICANITE PLATE.

STYLE "B".

(PATENTED.)

Furnished in sheets 36 inches square and of any thickness from $\frac{10}{1000}$ of an inch upwards.

This material is the cheapest Solid Sheet Mica Insulator that is possible to produce, and is one of the most efficient.

Our rapidly increasing sales show how thoroughly it is appreciated.

It is made of selected, pure India Sheet Mica split exceedingly thin.

The following tests made by Messrs. Herrick and Burke show its insulating value. It will be noticed that temperature has a remarkably small effect.

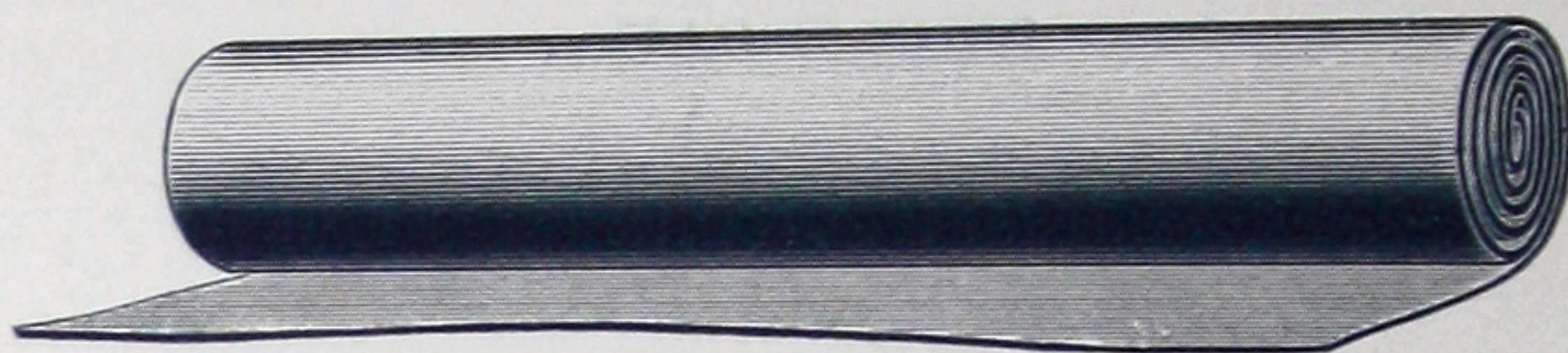
Breakdown voltage per mill of thickness 755.

Resistance :

30° cent.	814 million megohms per cubic inch.
100° cent.	680 " " " " "

Large sample of this material will be furnished upon application.

MICANITE CLOTH.

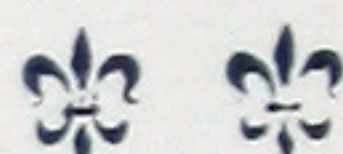


Rolls 16 feet long, 32 inches wide; sheets 32 inches square.
Non-absorptive and flexible.

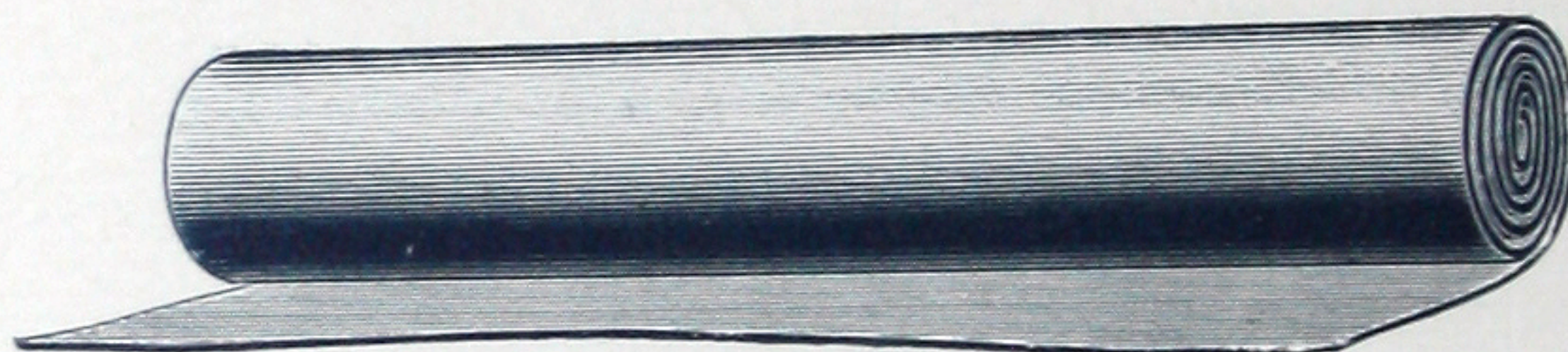
The following thicknesses are kept in stock:

Thickness.	Layers of Mica.	Approx. weight of Roll.	Approx. weight of Sheet.
$\frac{8}{1000}$	1	2 lb. 7 oz.	6.5 oz.
$\frac{11}{1000}$	2	3 " 8 "	9. "
$\frac{14}{1000}$	3	4 " 13 "	12.84 "

Other thicknesses made to order.



MICANITE PAPER.



Rolls 16 feet long, 32 inches wide; sheets 32 inches square.
Non-absorptive and flexible.

The following thicknesses are kept in stock:

Thickness.	Layers of Mica.	Approx. weight of Roll.	Approx. weight of Sheet.
$\frac{5}{1000}$	1	1 lb. 12 oz.	5 oz.
$\frac{8}{1000}$	2	3 " 1 "	8 "
$\frac{11}{1000}$	3	4 " 2 "	11 "

Other thicknesses made to order.

For general purposes Micanite Cloth and Paper are most useful and efficient insulators. They are principally used in the making and repairing of armatures, field magnets, transformers and all kinds of electrical apparatus. They are non-absorptive, can be kept in stock and remain flexible for a long time. They contain for the thickness of material the greatest possible amount of clear India Mica.

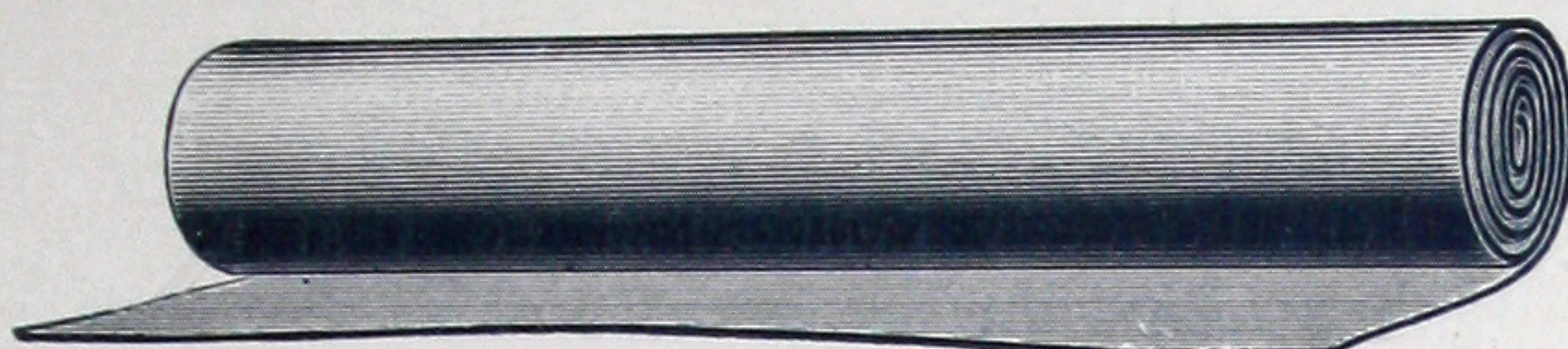
The Micanite Cloth has fine muslin on one side and paper on the other.

The Micanite Paper has paper on both sides.

The one layer paper and the two layer cloth are the most common thicknesses used.

EXTRA FLEXIBLE MICANITE CLOTH AND PAPER.

(PATENTED.)



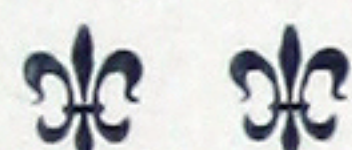
Rolls 16 feet long, 32 inches wide; sheets 32 inches square.

The following thicknesses are kept in stock:

Thickness.	Approx. weight of Roll.	Approx. weight of sheet.
$\frac{8}{1000}$	1 lb. 5½ oz.	.6¼ oz.
$\frac{11}{1000}$	1 " 8 "	6.60 "

This material, though more costly than the regular Micanite Cloth and of the same insulating value, has the advantage of being a better stock keeper. It will remain in the same degree of flexibility for years and whenever warmed its flexibility is still further increased and it is handled like a piece of ordinary muslin.

The $\frac{8}{1000}$ thicknesses have paper on both sides; the $\frac{11}{1000}$ thicknesses have paper on one side and a fine cambric on the other. The balance of thicknesses are made up of layers split exceedingly thin of the finest quality of India Mica.



RED PAPER AND MICA INSULATION.

We desire to say to our customers that we consider it part of our duties to make up any form of insulating material.

Some engineers with an eye to the first cost of electrical machinery prefer to use a larger proportion of paper than of Mica for insulation. We can quote prices on cylinders, troughs and other articles made up with any combination of materials desired.

We keep in stock Red Rope Paper of various thicknesses, Asbestos, etc., and we fill orders without delay.

PAPER AND MICA INSULATORS IN STOCK.

ARMATURE TROUGHS.

Type.

Gen'l Elect. Co., W. P. 50.....

" " " W. P. 30.....

CONSTRUCTION OF COMMUTATORS.

The mechanical construction of a commutator requires that each bar be insulated, yet kept perfectly cylindrical, so that the bars cannot be displaced from their position on the heating of commutator.

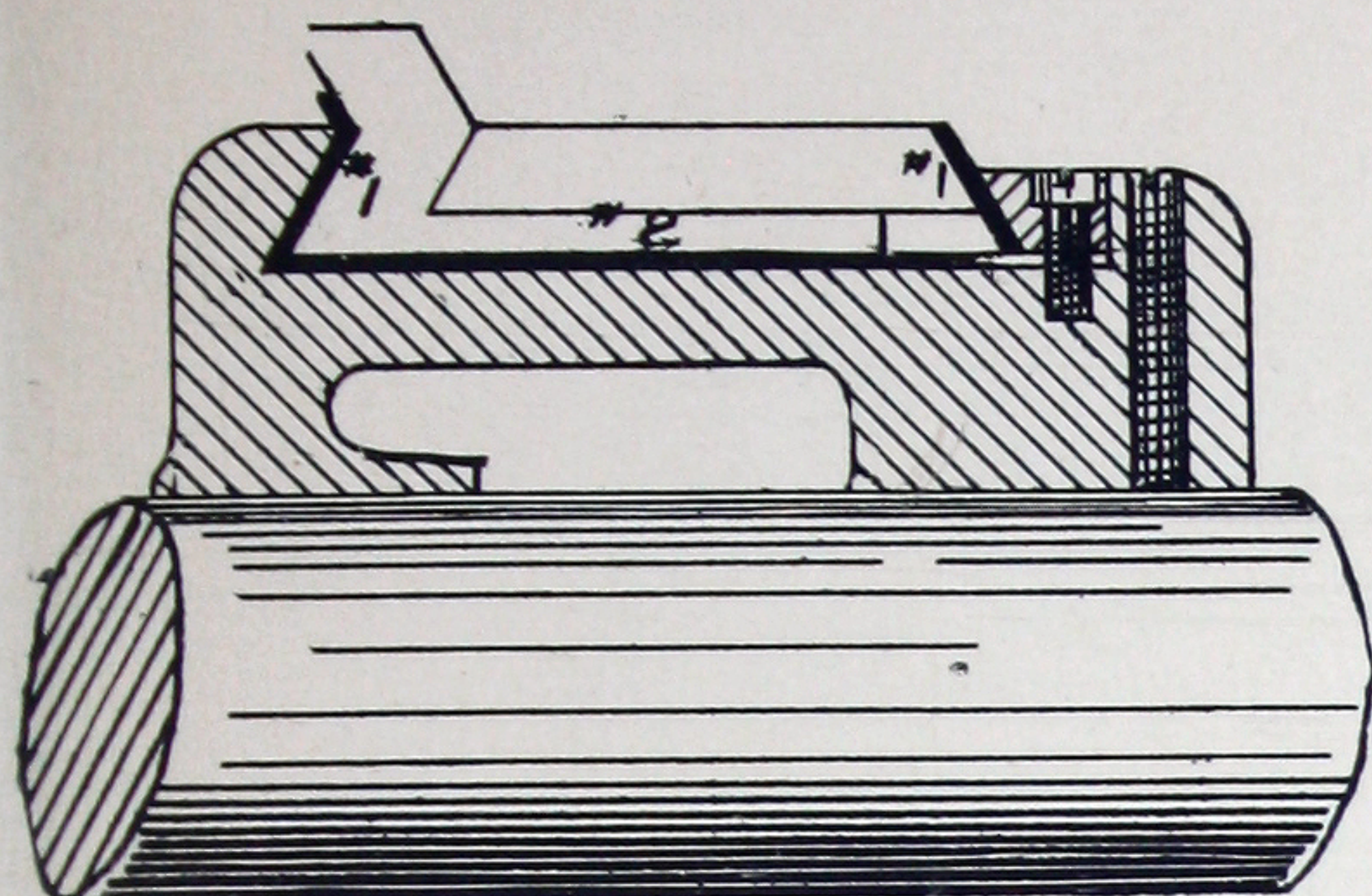
The difference in the expansion between the commutator segment and the iron shell puts the whole structure under considerable stress and the insulating medium has to be of great rigidity and maintain its rigidity under elevated temperatures, in order that the commutator in working condition remains truly concentric. The matter of applying the pressure to the commutator bars so as to keep them in alignment has been the subject of a great deal of study, and quite a number of means have been devised, as shown on page 23, for the purpose of securing and insulating these commutator segments. The general method is to clamp them between a "V" or sloping surfaces, so that pressure will be brought on all the commutator segments equally. Commutators should be raised to a higher temperature before they are finally turned down than that at which they are to be used, and the insulating medium should be such that it forms a perfectly homogeneous structure after it has been raised to the proper temperature.

Micanite was first developed for this purpose, and its success under these severe conditions led to its general adoption for insulating purposes.

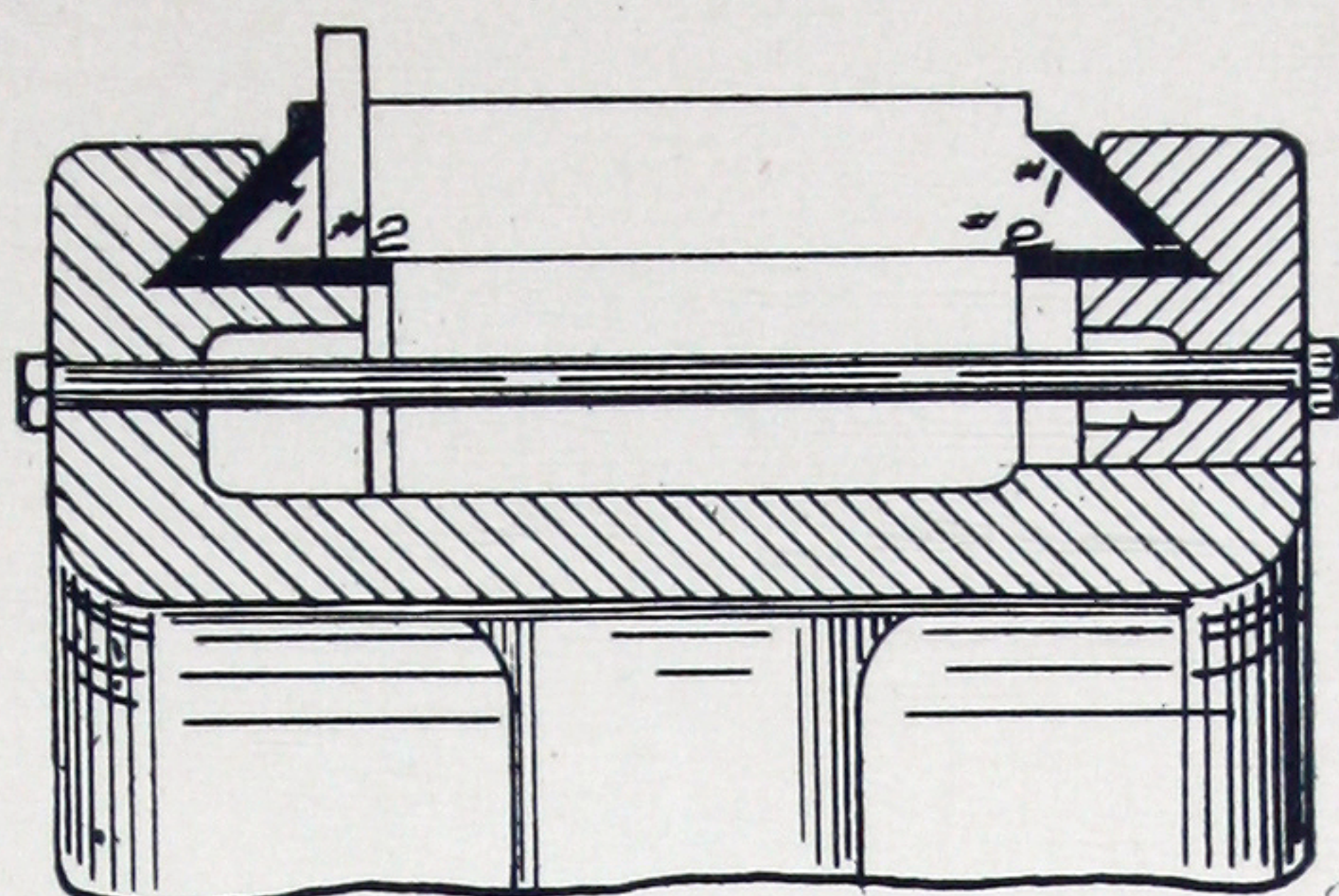
For dividing up a circle into any number of equal parts, such as required in the calculation of commutators, the segment and insulation are considered as one. Table 4 gives the ordinary divisions used from 20 to 250. The distance given, multiplied by the diameter of the commutator in inches will give the true width of each section in inches. In proportioning, the relation between the thickness of the Micanite and the segment must be fixed in each individual case, and no general rule can be given to guide the designer. The other proportions of a commutator depend upon the current density in the brushes. The current density for carbon brushes ranges from thirty amperes to fifty amperes per square inch of contact, forty amperes being probably the nearest general figure used by most of the designers. The conductivity of the carbon and the speed of the commutator both affect the proper density. The heating of the commutator is principally due to the brush resistance and friction and from three causes: the actual rubbing friction of the brush against the commutator surface; the local current circulated in the brush from one segment to the other, as the brush short circuits the armature loop; and the actual drop across the contact and through the brush to the current collected from the commutator. Copper brushes, either wire or thin plates, can carry from one hundred to one hundred and seventy-five amperes per square inch of contact surface; a brass gauze brush from one hundred to one hundred and twenty-five amperes and a copper gauze brush one hundred and fifty amperes. The temperature of commutators is generally kept below fifty degrees centigrade.

SIEMENS-HALSKE.
TAPER RINGS #1
SLEEVE FOR SHELL #2

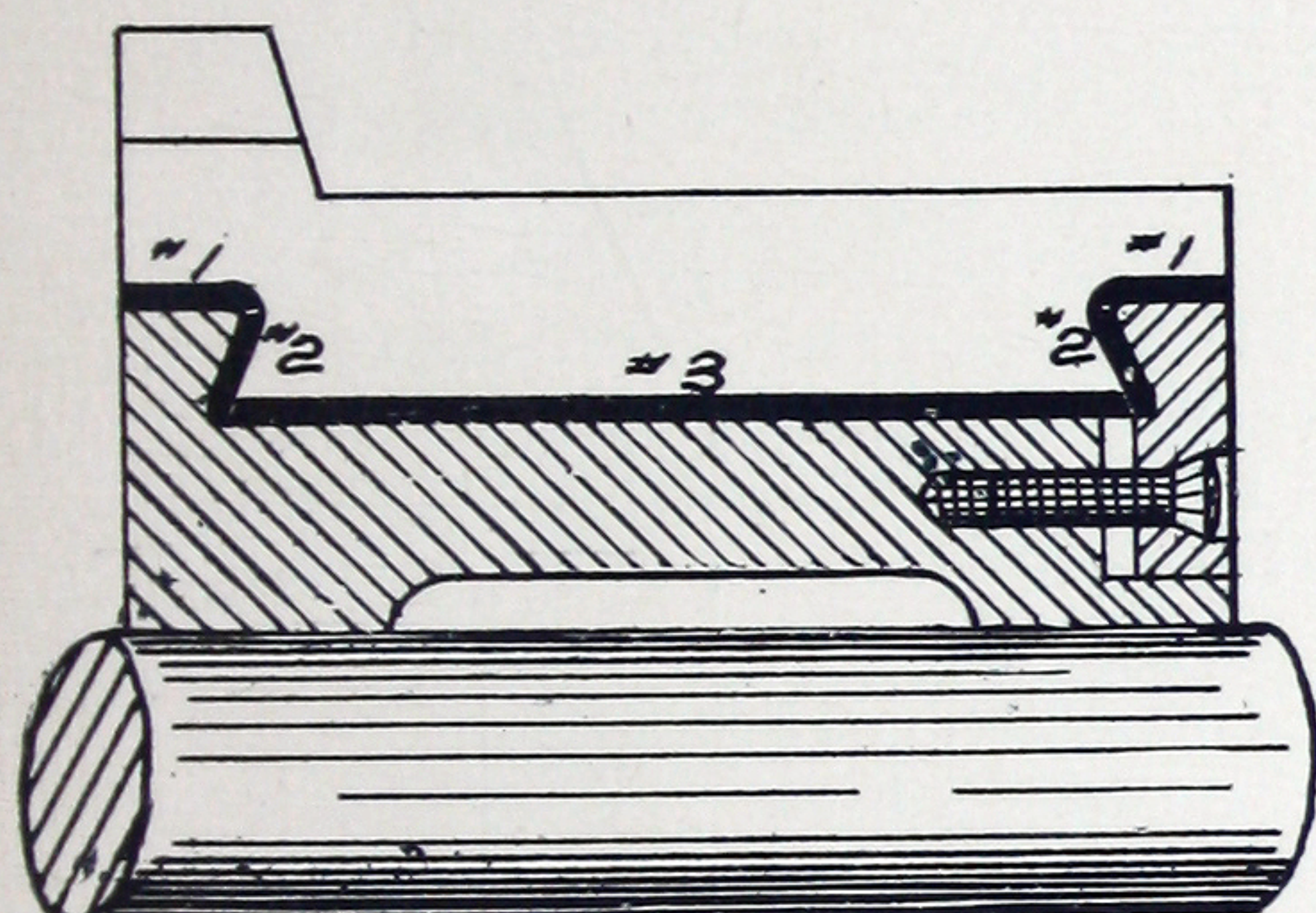
23



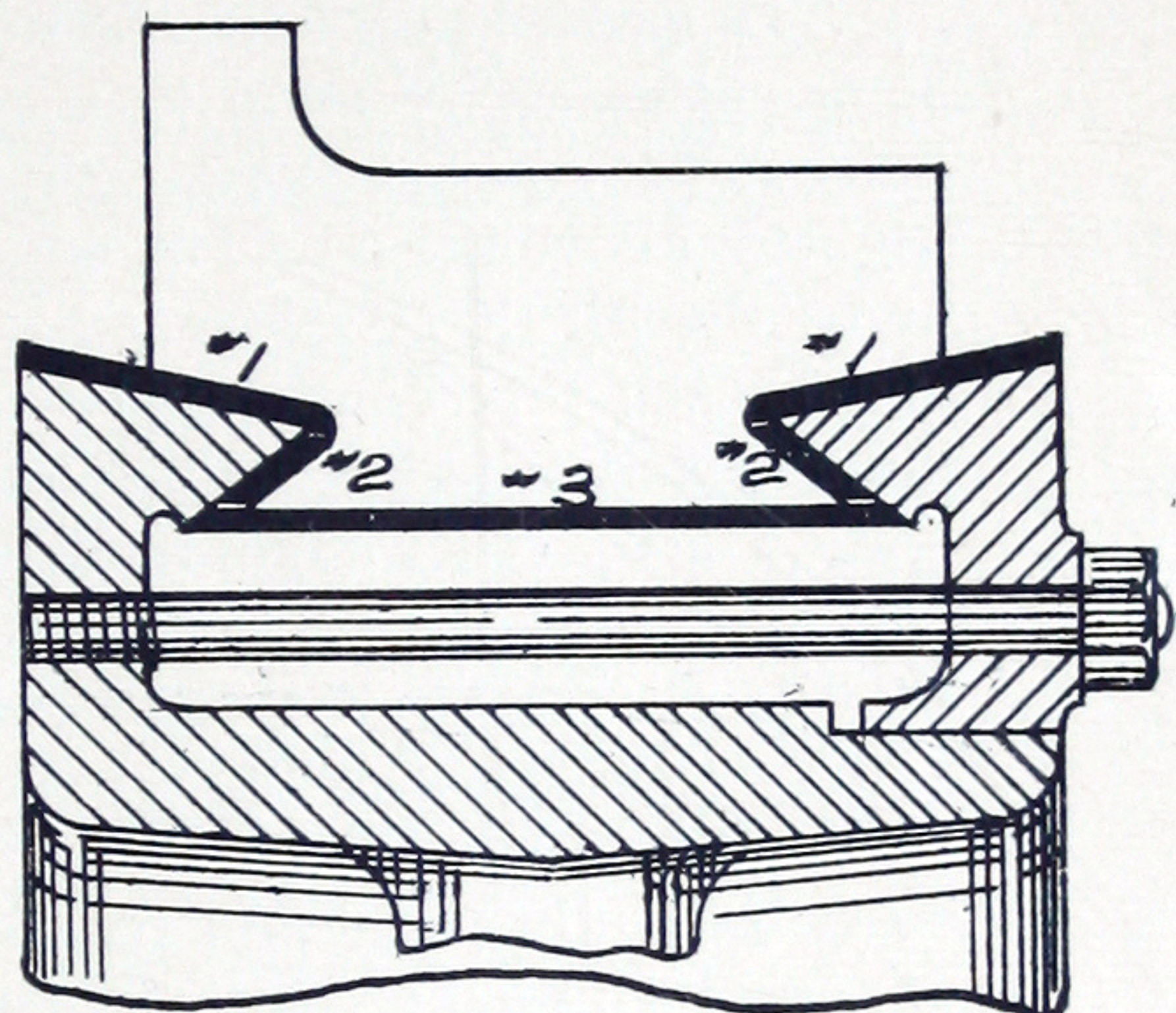
FT WAYNE.
TAPER RINGS #1
BAND RINGS #2



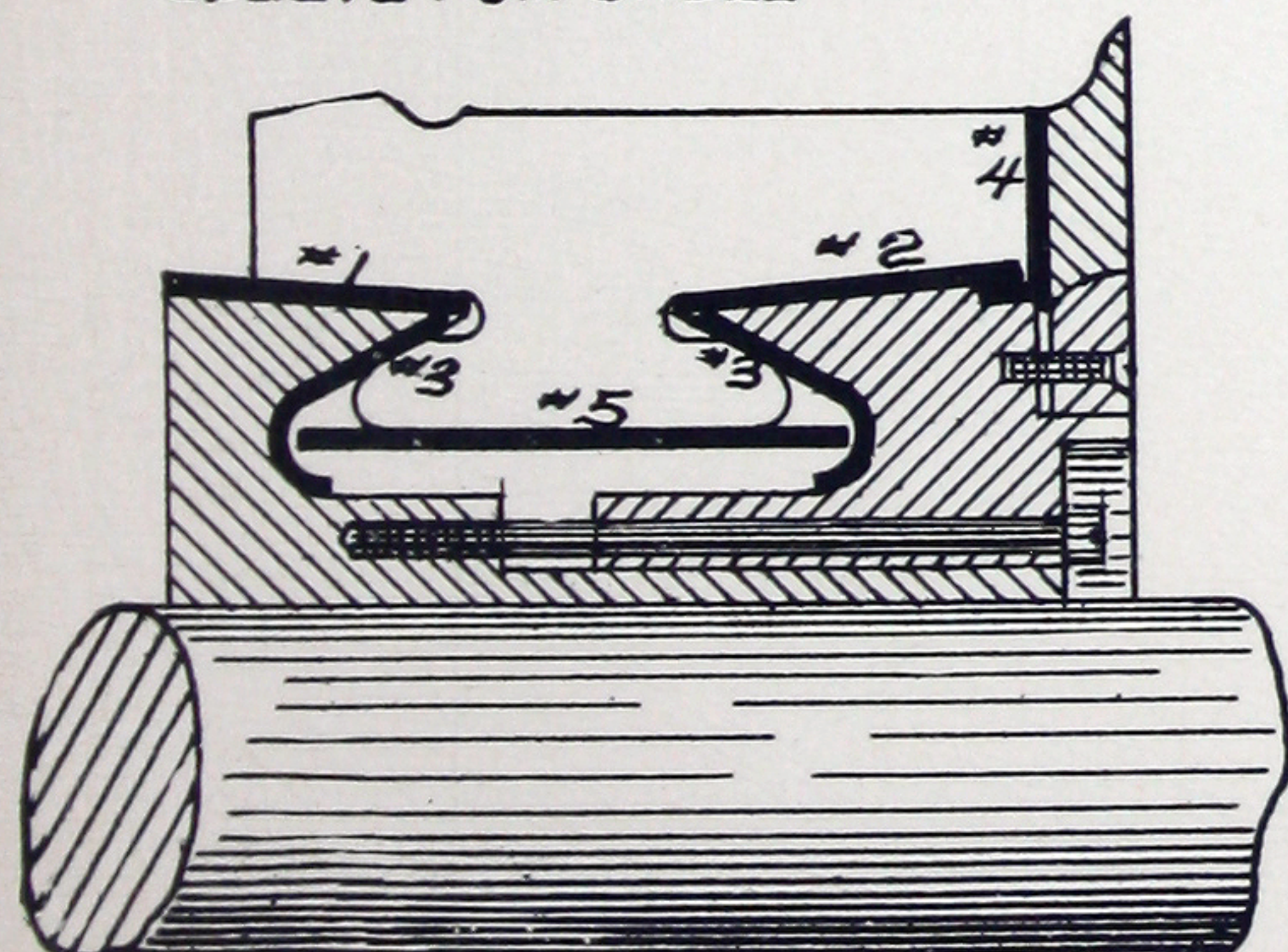
EDISON BI-POLAR
BAND RINGS #1
TAPER RINGS #2
SLEEVE FOR SHELL #3



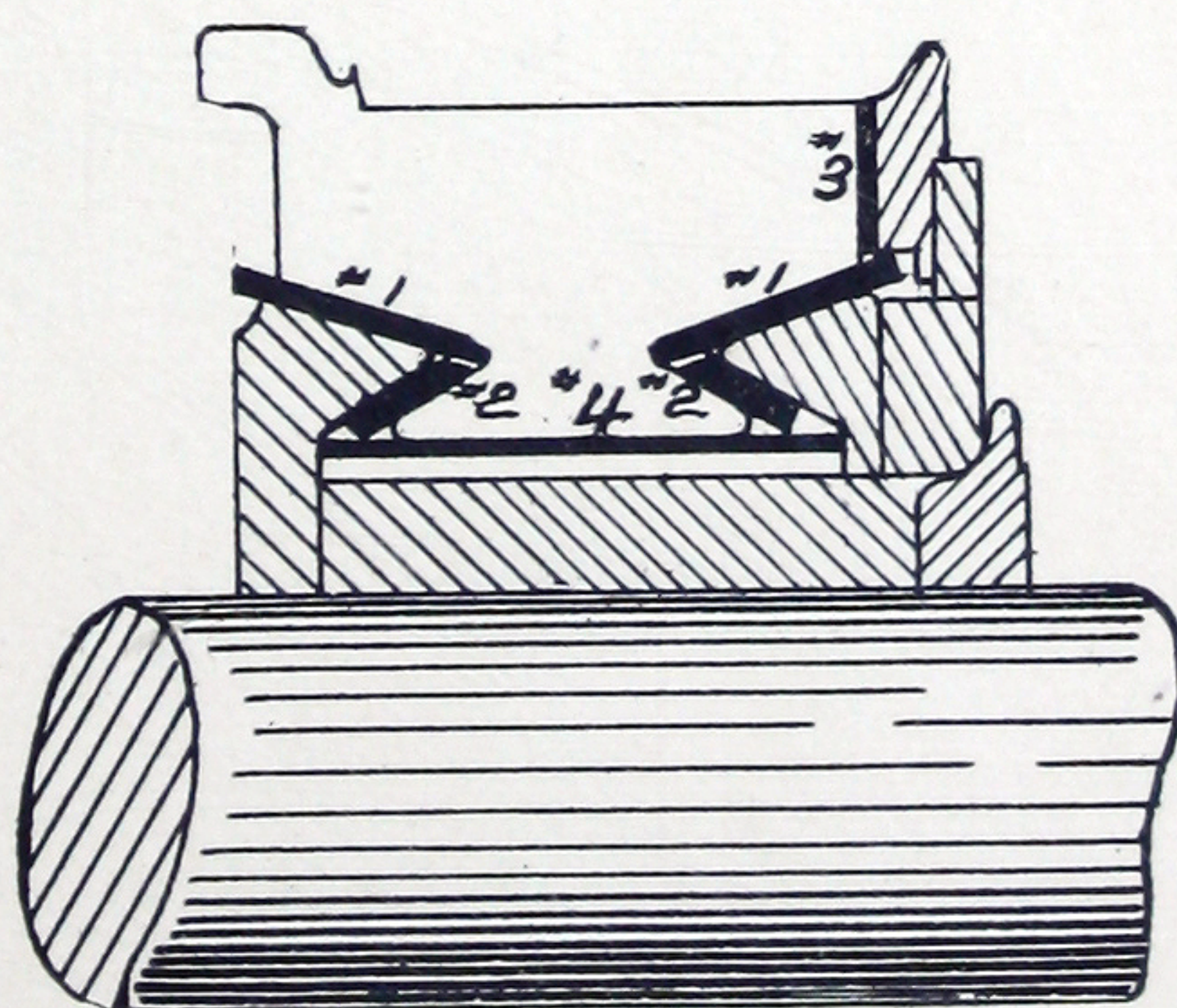
WALKER.
TAPER BAND RINGS #1
TAPER RINGS #2
SLEEVE FOR SHELL #3



G.E. 800.
TAPER BAND RING NARROW #1
TAPER BAND RING WIDE #2
TAPER RINGS #3
FLANGED FLAT RING #4
SLEEVE FOR SHELL #5

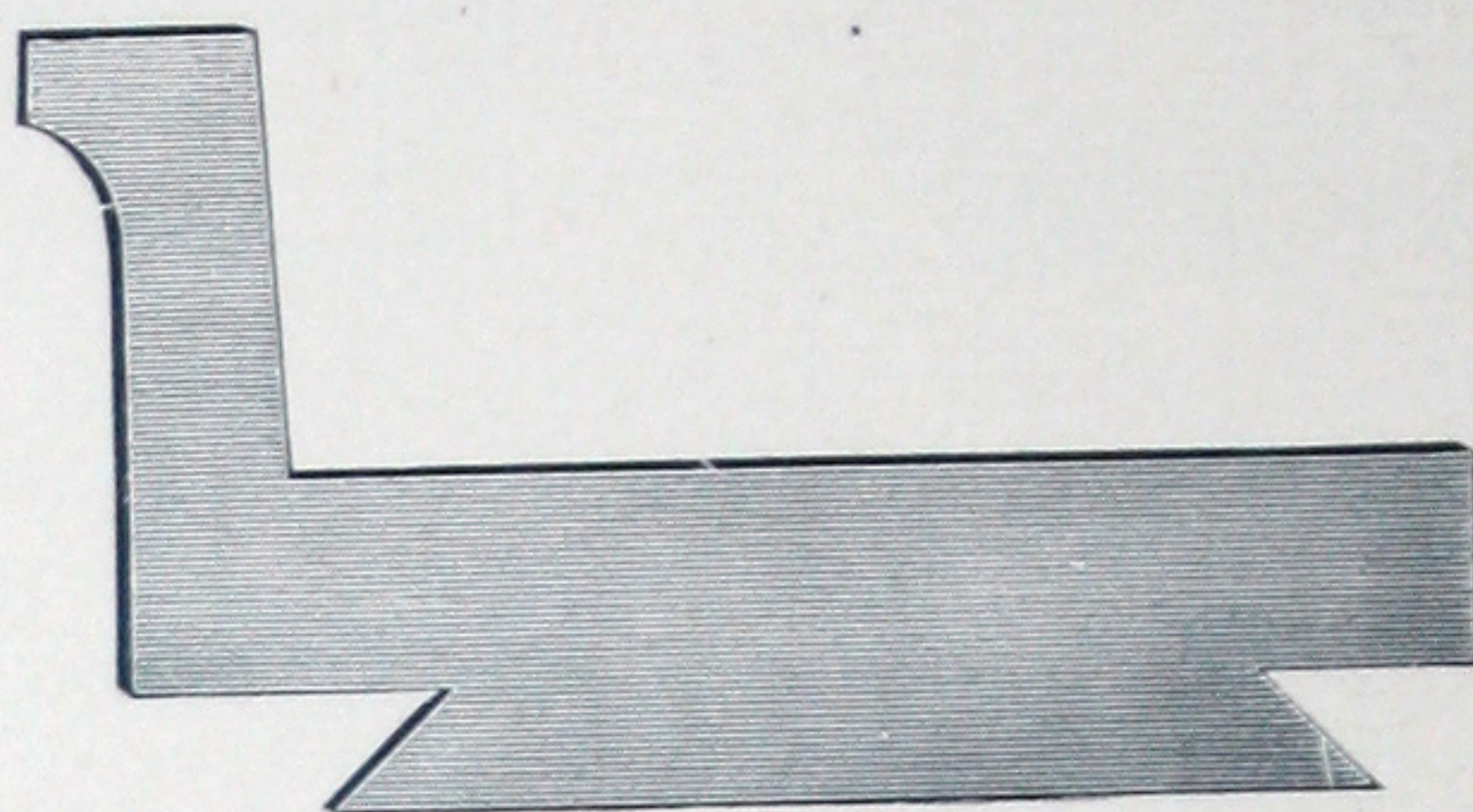


WESTINGHOUSE
TAPER BAND RINGS #1
TAPER RINGS #2
FLAT RING #3
SLEEVE FOR SHELL #4



MICANITE COMMUTATOR SEGMENTS.

(PATENTED.)



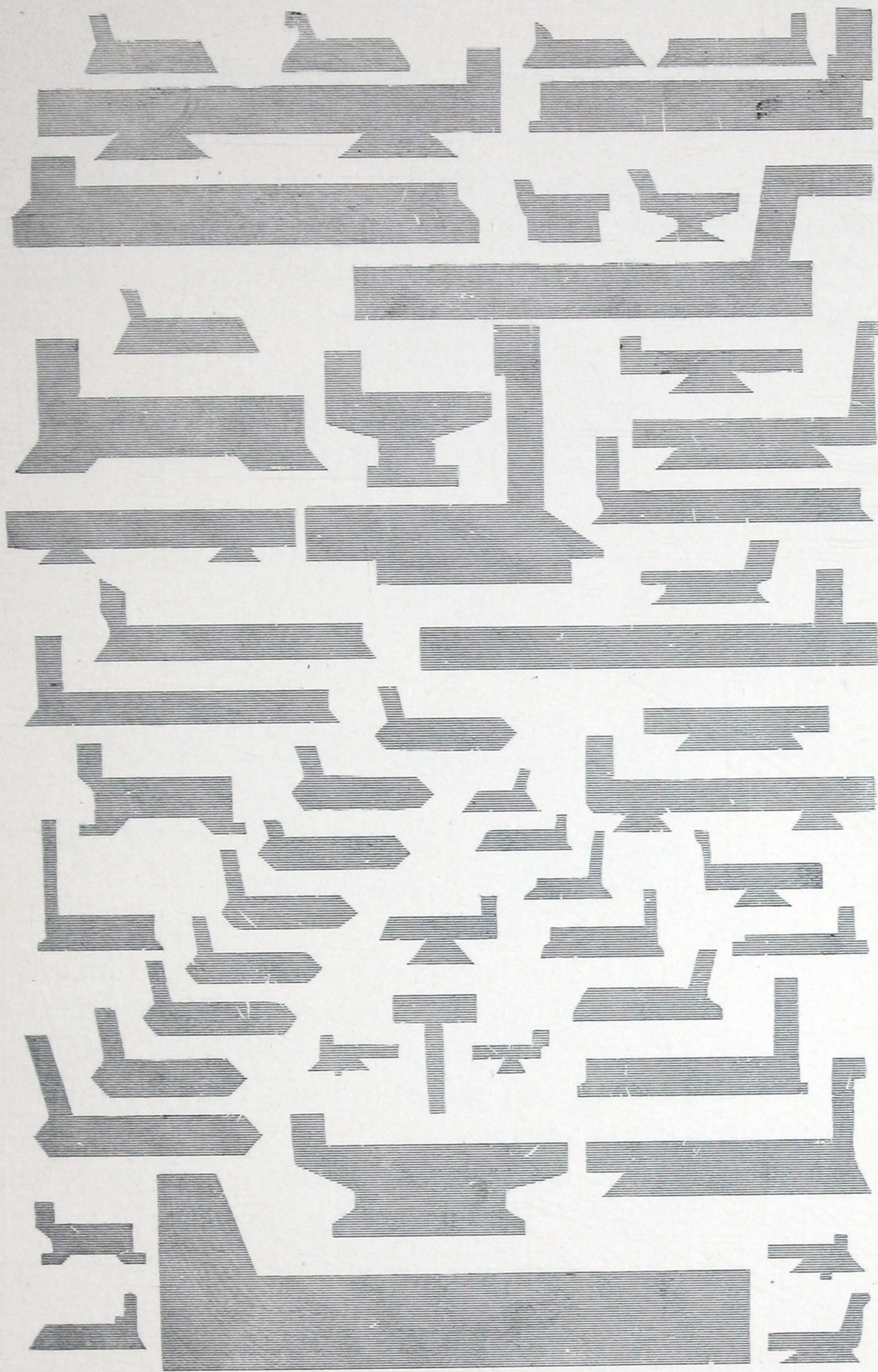
The material used for insulating commutator bars from each other must be of such density as to wear away with the metal of the commutator in order to prevent sparking, for it is evident that if the segment protrudes the slightest above the adjacent commutator segments, when the segment passes under the brush, it raises it and causes sparking between the commutator and brush; this can only be remedied by sand papering down the commutator and bringing the insulating segments and commutator bars again in line. On the other hand, if the material is too soft it will not allow proper assembling of the commutator, and the bars will work out of alignment. By long experience we have found the proper Mica and methods to produce a material which fulfills the requirements in commutator construction.

This is represented in large sheets by our No. 2 Special Micanite Plate described on page 18. We cut the segments from this plate in one solid piece, of any given thickness, to any pattern desired. However odd the pattern may be there is no charge for dies. Supplying completed segments in this form we save our customers both labor and material, besides making a far better segment.

When ordering segments outside of those given in the list for standard street railway motors, always send to us a pattern of some kind showing exact shape and thickness desired in thousandths of an inch.

On pages from 28 to 31 we give a list of commutator segments for standard street railway motors; these are kept in stock for quick delivery.

WE CAN CUT ANY PATTERN WITHOUT DELAY AS NO DIES ARE REQUIRED.



A few of the many Segments we are manufacturing.

WESTERN ELECTRIC COMPANY.

CHICAGO, July 20th, 1897.

MICA INSULATOR Co., Schenectady, N. Y.

Gentlemen:—In reply to yours of the 14th inst., we desire to say that we have used your Micanite Segments in the manufacture of our machines for several years, and have always found them satisfactory both in price and quality.

Yours truly,

WESTERN ELECTRIC CO.,

F. LANCASTER, Purchasing Agent.



SIEMENS & HALSKE ELECTRIC COMPANY.

GRANT WORKS, P. O. ILL., August 13th, 1897.

THE MICA INSULATOR COMPANY, No. 117 Lake St., Chicago, Ill.

MR. COLMAN, Chicago Agent.

Gentlemen:—In reply to your inquiry of the 6th inst. as to our opinion of Micanite Segments, as manufactured by you, will say that we have found them to be highly satisfactory for motors and dynamos of all sizes. In fact, we find a great saving over the cost of Mica by using these Segments, and if anything, they give better satisfaction.

We are not troubled with the oozing of the cement, as we understand these Segments are baked and pressed under a high pressure.

Yours very truly,

SIEMENS & HALSKE ELECTRIC CO.

Per J. H. EVANS

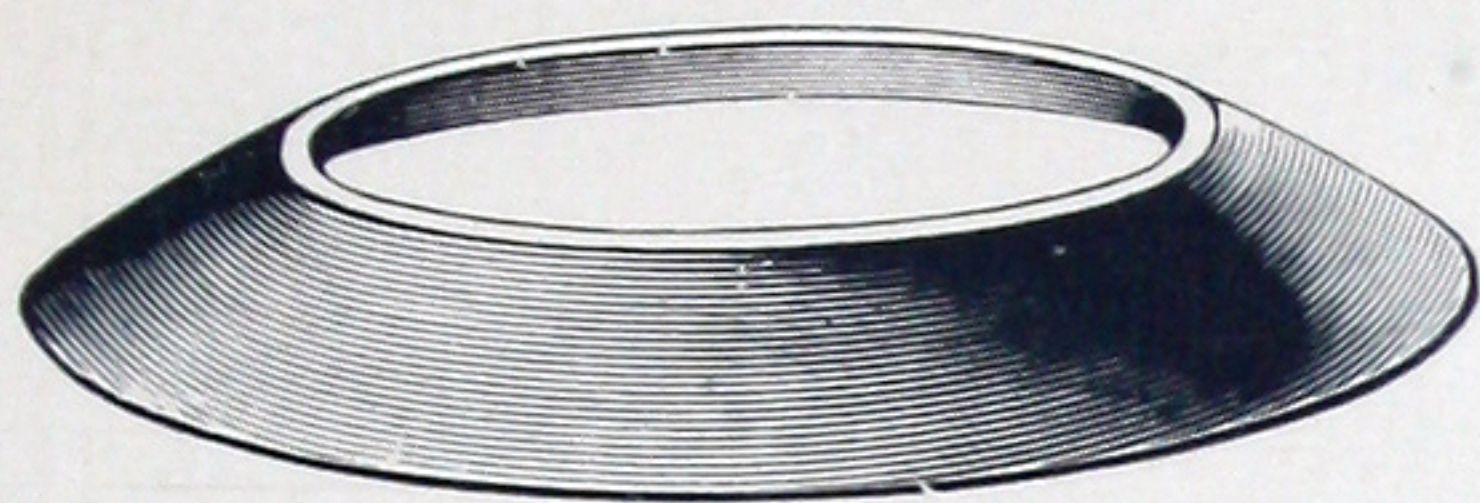
MICANITE RINGS.

(PATENTED.)

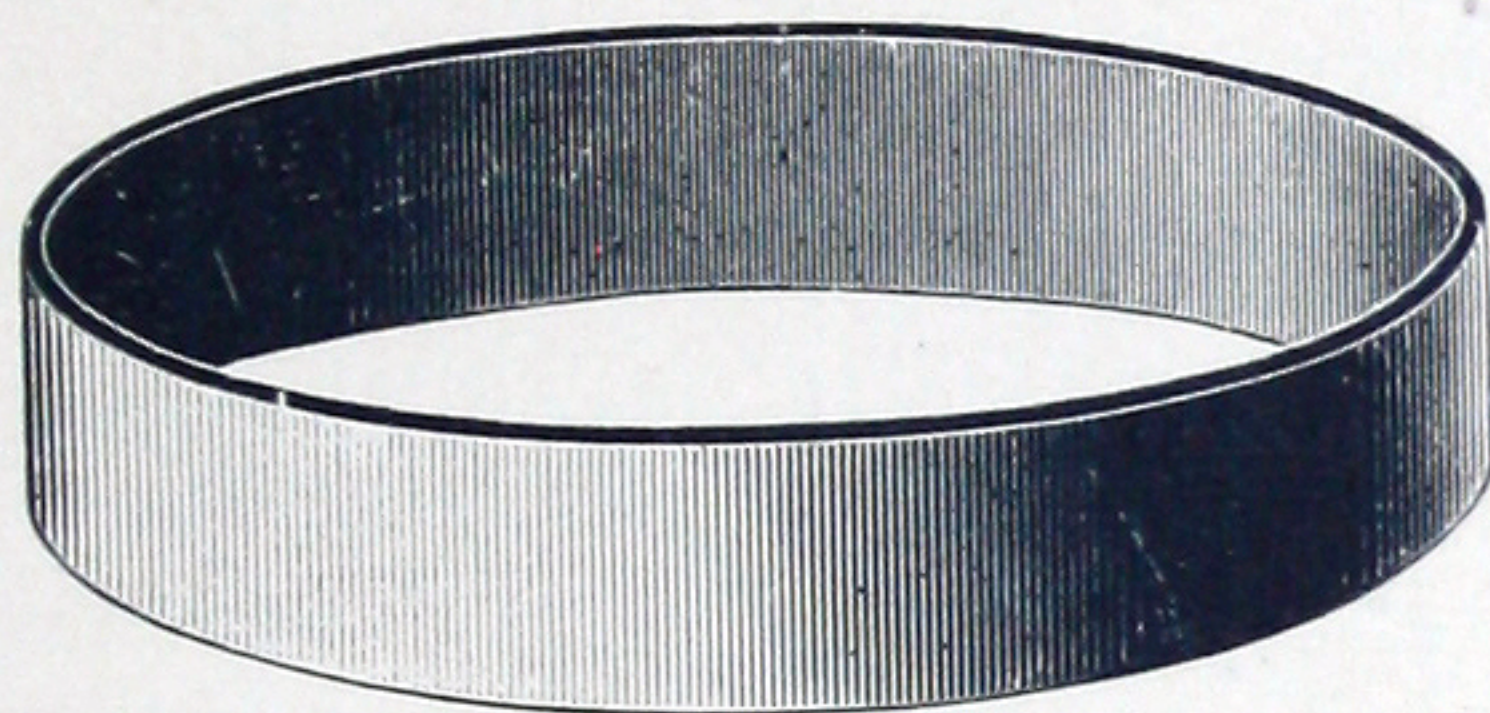
For Commutators, Transformers, Controllers, Field Magnets, etc.

With our improved machinery and immense stock of moulds we are able to manufacture rings of all shapes in large quantities and with great exactness as to size and finish.

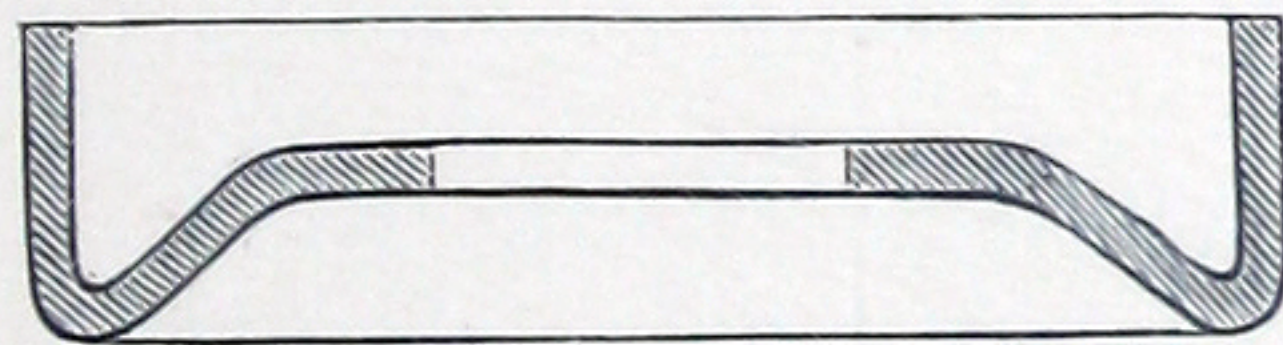
On pages 28 to 31 we give a list of Commutator Rings for standard street railway motors. These are kept in stock and we can give quick delivery for all repair work and emergencies. For other types of rings we require all necessary dimensions.



A ring of this shape we call a plain **Taper Ring**. Our stock of moulds will allow us to make these rings of almost any dimensions, angle or thickness, without the expense of a mould.



This ring we call, when made without a taper, a **Band Ring**. If with a slight taper, a taper band. Rings of this shape we can also make without a further charge for moulds.



Rings composed of a band and taper moulded in one solid piece as shown in the sketch, we call a **Special Moulded Ring**, and if not of a standard street railway type, a special mould is required. These moulds we make at cost for our customers, with the understanding that they remain in our hands indefinitely.

We desire to draw our customers' attention to the fact that many of the leading manufacturers have given up using rings of composite type, and have found it better practice to design their commutators so that separate band, taper and flat rings can be used.

MICANITE COMMUTATOR INSULATION

FOR

STANDARD RAILWAY MOTORS.

TYPE		No. per set.
GENERAL ELECTRIC CO.		
G. E. 800 Drum, Form 4.		
Segments.....	105	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Flat Ring, (flanged).....	1	
Sleeve for Shell.....	1	
G. E. 800 Drum, Form 6.		
Segments.....	105	
Taper Ring.....	2	
Taper Band Ring, (narrow) ...	1	
“ “ “ (wide).....	1	
Flat Ring, (flanged).....	1	
Sleeve for Shell.....	1	
G. E. 800 Ring, Form 3.		
Segments.....	130	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Flat Ring, (flanged).....	1	
Sleeve for Shell.....	1	
G. E. 1000.		
Segments.....	93	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Sleeve for Shell.....	1	
G. E. 1200, Form 2.		
Segments.....	105	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Flat Ring, (flanged).....	1	
Sleeve for Shell.....	1	
G. E. 2000.		
Segments.....	141	
Taper Ring.....	2	
Taper Band Ring, (narrow)...	1	
“ “ “ (wide).....	1	
Flat Ring, (flanged).....	1	
Sleeve for Shell.....	1	
G. E. 51.		
Segments.....	111	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Sleeve for Shell.....	1	
G. E. 52.		
Segments.....	87	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Sleeve for Shell.....	1	
G. E. 53.		
Segments.....	111	
Taper Ring.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Sleeve for Shell.....	1	
G. E. 57.		
Segments.....	99	
Taper Rings.....	2	
Taper Band Ring, (narrow)....	1	
“ “ “ (wide).....	1	
Sleeve for Shell.....	1	
W. P. 50 Thompson-Houston.		
Form 1.		
Segments.....	64	
Outer Taper Ring.....	2	
Inner “ “.....	2	
Sleeve for Shell.....	1	

	No. per set.		No. per set.
W. P. 50 Thompson-Houston.		F. 30 Thompson-Houston.	
Form 7.		Old Style.	
Segments.....	64	Segments ...	64
Outer Taper Ring.....	2	Outer Taper Ring.....	2
Inner " ".....	2	Inner " ".....	2
Sleeve for Shell.....	1	Sleeve for Shell.....	1
W. P. 50 Thompson-Houston.		F. 30 Thompson-Houston.	
Form 4.		Form 4.	
Segments.....	64	Segments.....	64
Taper Ring.....	2	Taper Ring.....	2
Taper Band Ring, (narrow)....	1	Taper Band Ring (narrow)....	1
" " " (wide).....	1	" " " (wide).....	1
Sleeve for Shell.....	1	Sleeve for Shell.....	1
W. P. 50 Thompson-Houston.		F. 20 Thompson-Houston.	
Form 6.		Old Style.	
Segments.....	64	Segments.....	64
Taper Ring.....	2	Outer Taper Ring.....	2
Taper Band Ring, (narrow)....	1	Inner " ".....	2
" " " (wide).....	1	Sleeve for Shell.....	1
Sleeve for Shell.....	1		
W. P. 30 Thompson-Houston.		F. 20 Thompson-Houston.	
Form 1.		Form 4.	
Segments.....	64	Segments.....	64
Outer Taper Ring.....	2	Taper Ring.....	2
Inner " ".....	2	Taper Band Ring, (narrow)....	1
Sleeve for Shell.....	1	" " " (wide).....	1
		Sleeve for Shell.....	1
W. P. 30 Thompson-Houston.		S. R. G., Thompson-Houston.	
Form 7.		Old Style.	
Segments.....	64	Segments.....	64
Outer Taper Ring.....	2	Outer Taper Ring.....	2
Inner " ".....	2	Inner " ".....	2
Sleeve for Shells..	1	Sleeve for Shell.....	1
W. P. 30 Thompson-Houston.		No. 6 Edison, Old Style.	
Form 4.			
Segments.....	64	Segments.....	56
Taper Ring.....	2	Taper Ring, (narrow)....	1
Taper Band Ring, (narrow) ...	1	" " (wide).....	1
" " " (wide).....	1	Sleeve for Shell.....	1
Sleeve for Shell.....	1		
W. P. 30 Thompson-Houston.		No. 8 Edison.	
Form 6.			
Segments.....	64	Segments.....	56
Taper Ring.....	2	Taper Ring.....	2
Taper Band Ring, (narrow)....	1	Band Ring, (narrow).....	1
" " " (wide).....	1	" " (wide).....	1
Sleeve for Shell.....	1	Sleeve for Shell.....	1

	No. per set.		No. per set.
No. 14 Edison.		No. 38 S. C.	
Segments	120	Segments	135
Taper Ring	2	Taper Ring	2
Band Ring, (narrow)	1	Taper Band Ring	2
“ “ (wide)	1	Flat Ring for end of Segments,	1
Sleeve for Shell	1	Sleeve for Shell	1
No. 12 Edison.		WALKER COMPANY.	
Segments	140	No. 10s 2000, Form D.	
Taper Ring	2	Segments	101
Band Ring, (narrow)	1	Moulded End Rings	2
“ “ (wide)	1	Flat Ring for end of Segments,	1
Sleeve for Shell	1	Sleeve for Shell	1
No. 16 Edison.		No. 10s 2000, 50 H. P.	
Segments	140	Segments	95
Taper Ring	2	Moulded End Rings	2
Band Ring, (narrow)	1	Flat Ring for end of Segments,	1
“ “ (wide)	1	Sleeve for Shell	1
Sleeve for Shell	1		
No. 6 Sprague.		No. 3s 800.	
Segments	56	Segments	109
Taper Ring, (narrow)	1	Moulded End Rings	2
“ “ (wide)	1	Flat Ring for end of Segments,	1
Sleeve for Shell	1	Sleeve for Shell	1
WESTINGHOUSE		No. 4s 1000, Form G, 25 H. P.	
ELECTRIC M'F'G. CO.		Segments	97
No. 3.		Moulded End Ring	2
Segments	95	Flat Ring for end of Segments,	1
Taper Ring	2	Sleeve for Shell	1
Taper Band Ring	2	No. 4, 1000, Form A. & B., 25 H. P.	
Flat Ring for end of Segments,	1	Segments	95
Sleeve for Shell	1	Moulded End Rings	2
No. 12.		Flat Ring for end of Segments,	1
Segments	95	Sleeve for Shell	1
Taper Ring	2	No. 5, 1200, Form G, 30 H. P.	
Taper Band Ring	2	Segments	97
Flat Ring for end of Segments,	1	Moulded End Rings	2
Sleeve for Shell	1	Flat Ring for end of Segments,	1
No. 12 A.		Sleeve for Shell	1
Segments	93	No. 5, 1200, Form A. & B., 30 H. P.	
Taper Ring	2	Segments	95
Taper Band Ring	2	Moulded End Rings	2
Flat Ring for end of Segments,	1	Flat Ring for end of Segments,	1
Sleeve for Shell	1	Sleeve for Shell	1

	No. per set.		No. per set.
50 H. P., 140 Y.		Taper Band Ring, (narrow)....	1
Segments.....	101	“ “ “ (wide).....	1
Moulded End Rings....	2	Sleeve for Shell.....	1
Flat Ring for end of Segments,	1		
Sleeve for Shell.....	1	No. 22.	
75 H. P., No. 15s, 3000, Form A.		Segments.....	87
Segments.....	227	Taper Ring.....	2
Moulded End Rings.....	2	Taper Band Ring.....	2
Flat Ring for end of Segments,	1	Sleeve for Shell.....	1
Sleeve for Shell.....	1	No 28.	
S. R. G., Short, 30 H. P.		Segments.....	87
Segments.....	144	Taper Ring.....	2
Taper Rings.....	2	Taper Band Ring.....	2
Band Ring.....	1	Sleeve for Shell.....	1
Flat Ring.....	1	No. 34.	
Sleeve for Shell.	2	Segments.....	99
Short, D. R., 15 H. P.		Taper Ring.....	2
Segments... ..	64	Taper Band Ring, (narrow)....	1
Taper Rings.....	2	“ “ “ (wide).	1
Sleeve for Shell.....	6	Sleeve for Shell.....	1
		C. 60.	
THE JOHNSON COMPANY.		Segments.....	99
No. 18.		Taper Ring, (narrow).....	1
Segments.....	111	“ “ (wide).....	1
Taper Rings.....	2	Sleeve for Shell.....	1
Band Rings....	2	D. 50.	
Sleeve for Shell.....	1	Segments.....	99
No. 20.		Taper Ring.....	2
Segments.....	99	Taper Band Ring.....	2
Taper Ring.....	2	Sleeve for Shell.....	1

MICANITE TROUGHS.

(PATENTED.)

FOR SLOTTED ARMATURES, ETC.



In high tension and railway tooth armatures, Micanite Troughs are used for the protection of the conductors, wound around the armatures, and these troughs can be made any size to fit any slot, if the dimensions are given, also the thickness of insulation required. For data in figuring see Table No. 1. We also make rectangular and round tubes in which armature bars can be slipped, in this way thoroughly insulating the armature bar from the body.

Designers using our Micanite Troughs can, with a given potential, get a greater output out of the same armature body by increasing the section of copper and decreasing the thickness of insulation, on account of the vastly high insulating qualities of Micanite for a given thickness for paper, cellulose or carbonizable material, such as have been used for armature construction.



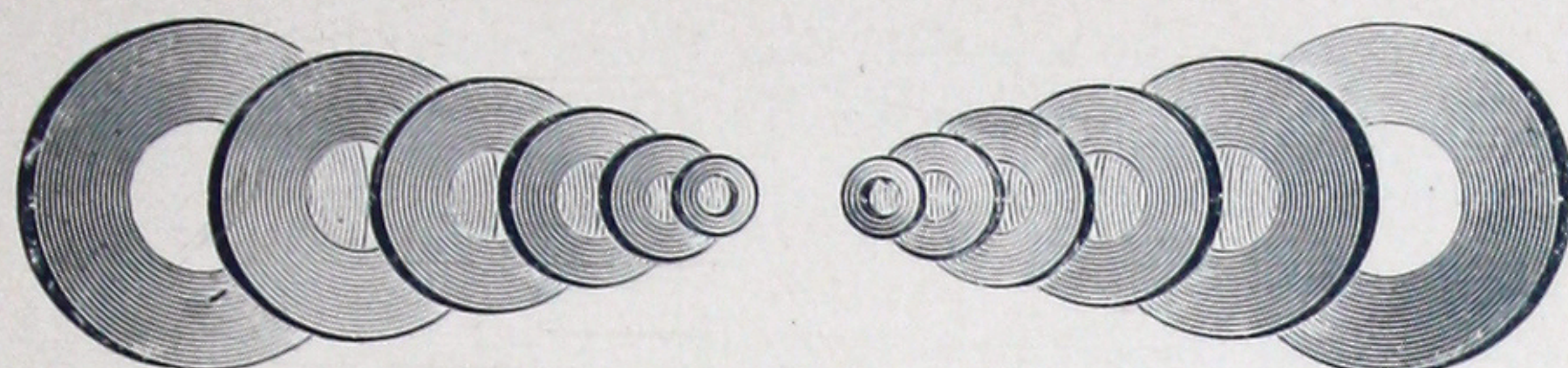
Our stock of moulds is very large. Troughs of these sections we can invariably make without a further charge for a mould.

The following street railway motor armature troughs are kept in stock :

Type.	Number per set.
General Electric Co., G. E. 800 Gramme.....	65
“ “ “ “ 800 Drum.....	120
“ “ “ W. P. 50.....	64
“ “ “ “ 30.....	64
Westinghouse, No. 3.....	95
“ “ 12.....	93

MICANITE FLAT RINGS, WASHERS, ETC.

(PATENTED.)



Standard list of Micanite Washers.

$\frac{1}{16}$ " thick.

Diameter.....	$\frac{9}{16}$ "	$\frac{3}{4}$ "	$\frac{7}{8}$ "	1"	$1\frac{1}{4}$ "	$1\frac{3}{8}$ "	$1\frac{1}{2}$ "	$1\frac{3}{4}$ "	2"	$2\frac{1}{4}$ "
Size of hole....	$\frac{1}{4}$ "	$\frac{5}{16}$ "	$\frac{3}{8}$ "	$\frac{7}{16}$ "	$\frac{1}{2}$ "	$\frac{9}{16}$ "	$\frac{5}{8}$ "	$\frac{11}{16}$ "	$\frac{13}{16}$ "	$\frac{15}{16}$ "
Diameter.....	$2\frac{1}{2}$ "	$2\frac{3}{4}$ "	3"	$3\frac{1}{4}$ "	$3\frac{1}{2}$ "	$3\frac{3}{4}$ "	4"	$4\frac{1}{4}$ "	$4\frac{1}{2}$ "	
Size of hole.....	$1\frac{1}{16}$ "	$1\frac{1}{4}$ "	$1\frac{3}{8}$ "	$1\frac{1}{2}$ "	$1\frac{5}{8}$ "	$1\frac{3}{4}$ "	$1\frac{7}{8}$ "	2"	$2\frac{1}{8}$ "	

Washers of irregular and larger sizes made to order.

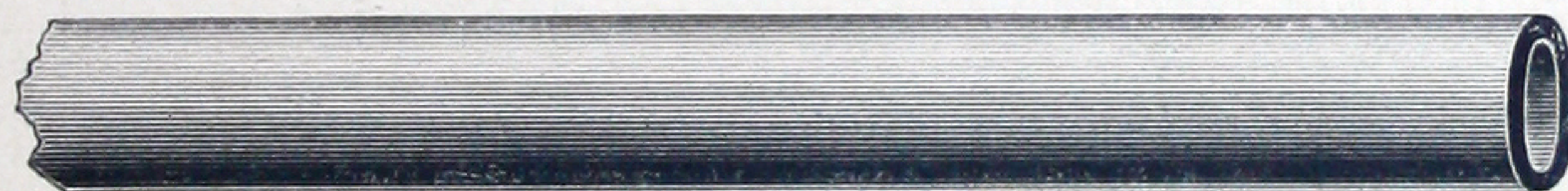
No charge for dies.

Prices on application.



MICANITE TUBES.

(PATENTED.)



Micanite tubes of circular, square, elliptical, or of any irregular section, and of any size and length, we make to order.

These tubes are made throughout entirely of Sheet Mica, and for insulating armature conductors, armature core bolts, interior conduits, etc., they are unequalled.

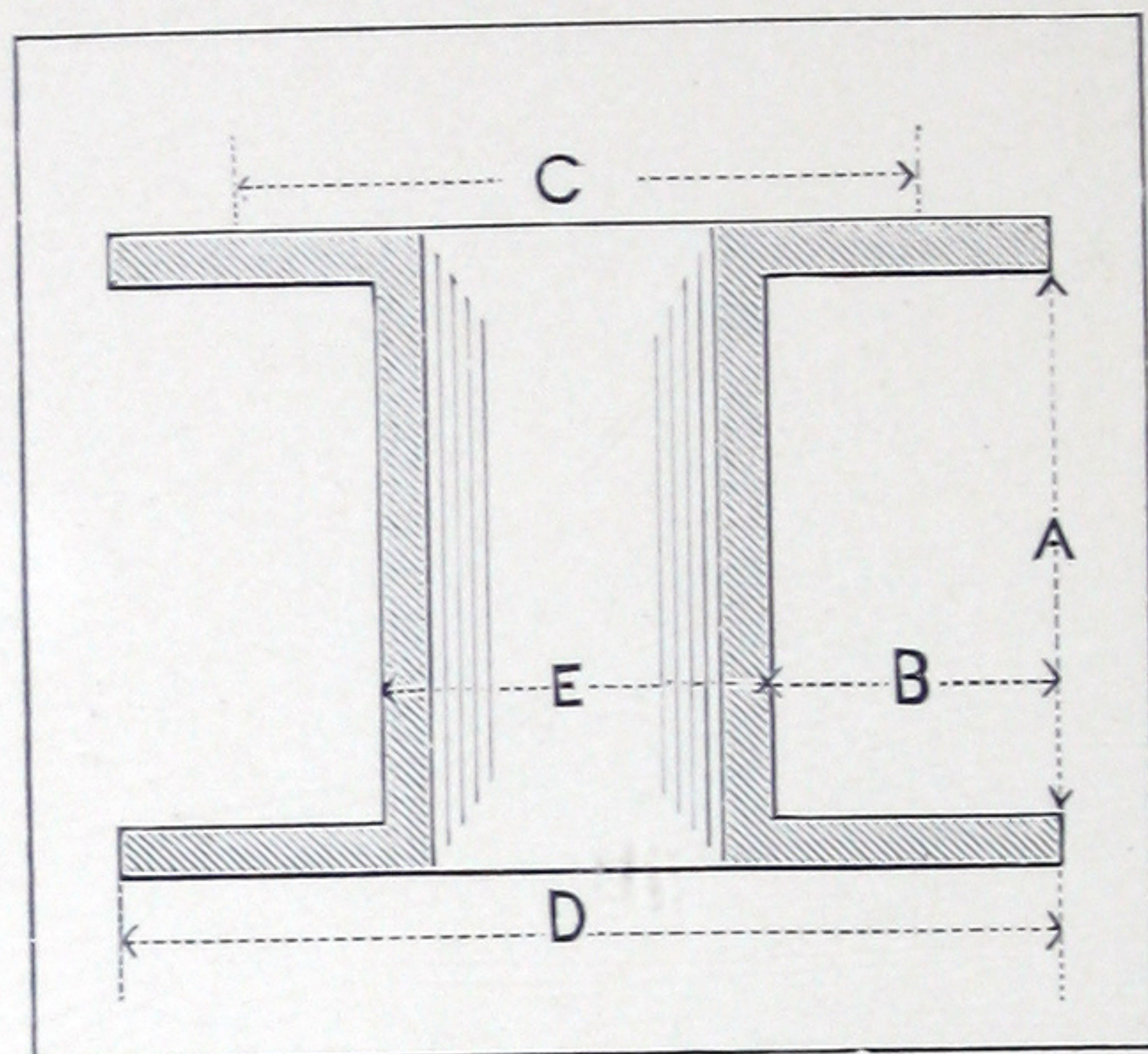
Tubes of the following internal diameters are kept in stock :

$\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{9}{16}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$, $1\frac{5}{16}$, $1\frac{1}{2}$, 2, $2\frac{5}{16}$ inches.

Any thickness and length desired.

FIELD SPOOLS.

Table No. 5, can also be used to figure the resistance of Field Spools, as follows: Let A be the distance between inside flanges of Micanite Spool, B the winding depth; then diameter of wire selected, divided into A, will be turns per layer, and diameter of wire divided into B, will be number of layers; both multiplied together will be the total turns of that wire, which can be wound on the Spool. For length of wire, halve the sum of the



diameters E and D in inches, and this will give C, which multiplied by $\frac{3}{1416}$ will give length of mean turn in inches, which multiplied by the total number of turns, will give the total length of wire in inches, of the size selected. But in order to readily figure what resistance a given spool will have when wound with different wires, find the area through which all wires pass and also the volume of spool which will be occupied by winding only; then if a certain required resistance is to be wound on the spool, divide the volume into the

resistance and look in the table for wire which gives the nearest value for resistance per cubic inch, which will be the proper wire. Where the number of turns is required, find the area in square inches, through which all turns pass and divide this into the required number of turns; look in column 4, turns per square inch for nearest figure, and this will be the wire required for the desired number of turns around the spool. For current to be carried by the winding on a solenoid or electro magnet, this depends on the surface exposed to radiate the heat generated in the coil, and a formulæ given by Fessen agrees well with that obtained in practice.

Temperature raise in degrees Fahrenheit is equal to watts expended in heating coils, divided by exposed surface in square inches, and the result multiplied by one hundred for a constant.

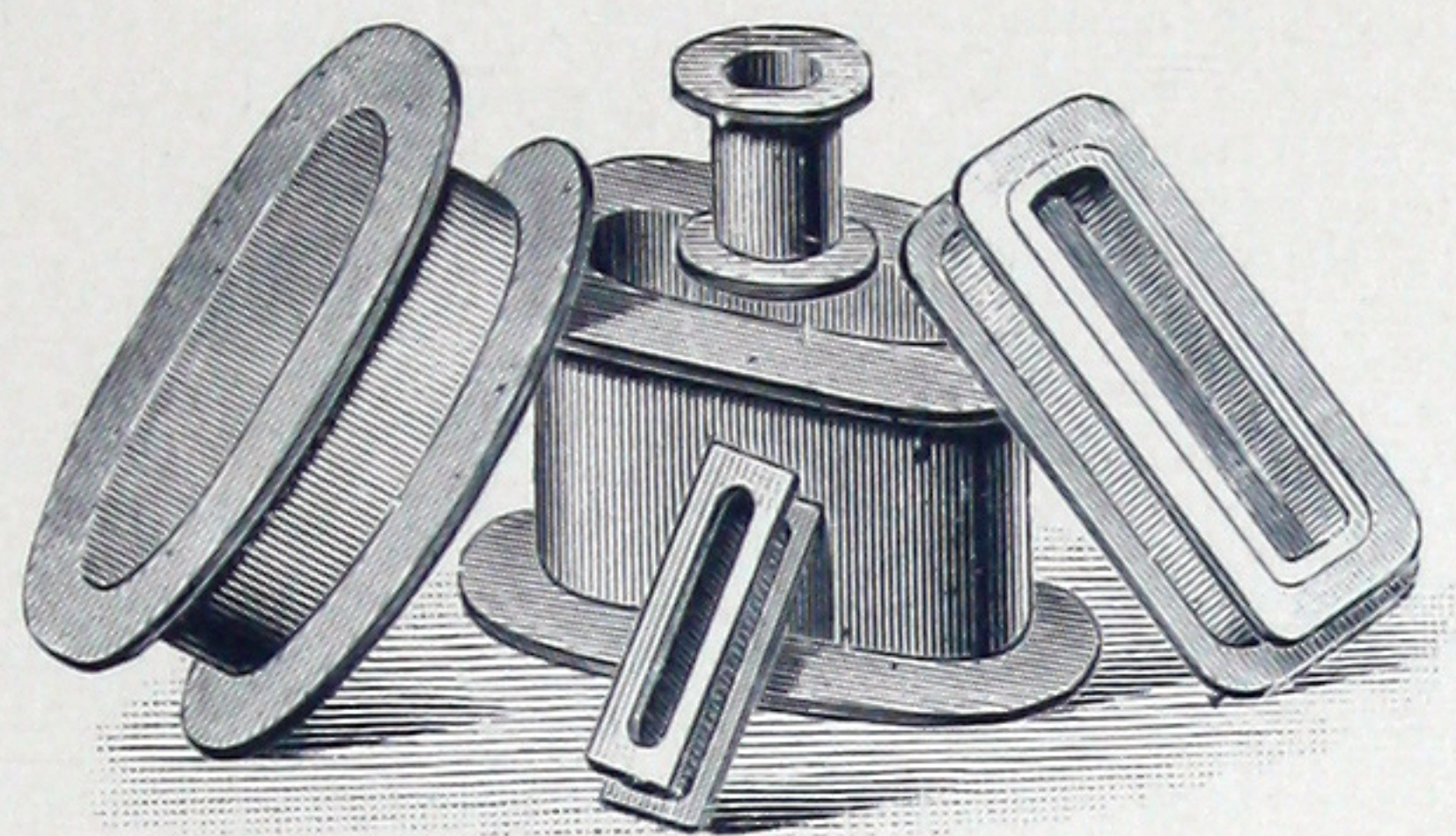
In a given size spool with a fixed number of watts to be lost only a given number of turns can be obtained, whatever the current or size wire may be.

In a given spool with a fixed potential, only a given number of turns can be had if temperature of spool is fixed, to increase the number of turns the spool has to be made larger or the temperature raised.

Where temperature's rise of a spool is fixed, its resistance should be such that across the potential it is to be operated, the current flow through the spool will be that obtained by dividing the potential by its resistance and the current multiplied by the potential should not be a greater number of watts than one-third the square inches of radiating surface that the spool presents.

MICANITE FIELD MAGNET AND TRANSFORMER SPOOLS.

(PATENTED.)



To give an idea of the potentials under which a field is sometimes subjected, we will state that a potential of over 60,000 volts can be obtained on the instantaneous breaking of the 400 K. W. Multipolar field, the dynamo having a normal potential of 150 volts. The self induction upon breaking the circuit creates this abnormal potential, and consequently the insulation of a field spool should be vastly higher than that required by the normal potential for which the spools are designed, in order to maintain the insulation of the field in the event of this circuit being broken. Again it has been found that wherever dynamo machinery is subjected to lightning discharges the field is a weak point where a break will occur.

In the manufacture of **Micanite Field Spools** we have solved the difficulty of making an independent spool of very high insulation, and the point where the core and the flanges join, which is usually a weak one, in our spools is continuous construction and is as strong as any other part of the spool.

Transformer Spools can be formed up to hold the windings, and entirely separate and insulate them from the iron core of the transformer. The high potential difference that can exist between the primary and secondary windings without a breakdown, increases the safety in the use of transformers and more turns can be made around the same transformer cores with greater insulation when using Micanite for this purpose.

The value of these spools for this purpose is especially evident when using them in step-up and step-down long distance transformers where many thousand volts difference exists between primary and secondary windings.

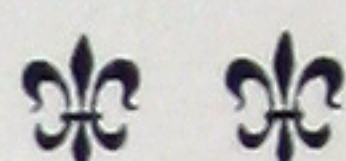
These spools will stand handling and years of wear without collapsing.

We make spools for all standard generators and motors to order.

MICANITE SPOOLS FOR ELECTRO MAGNETS.

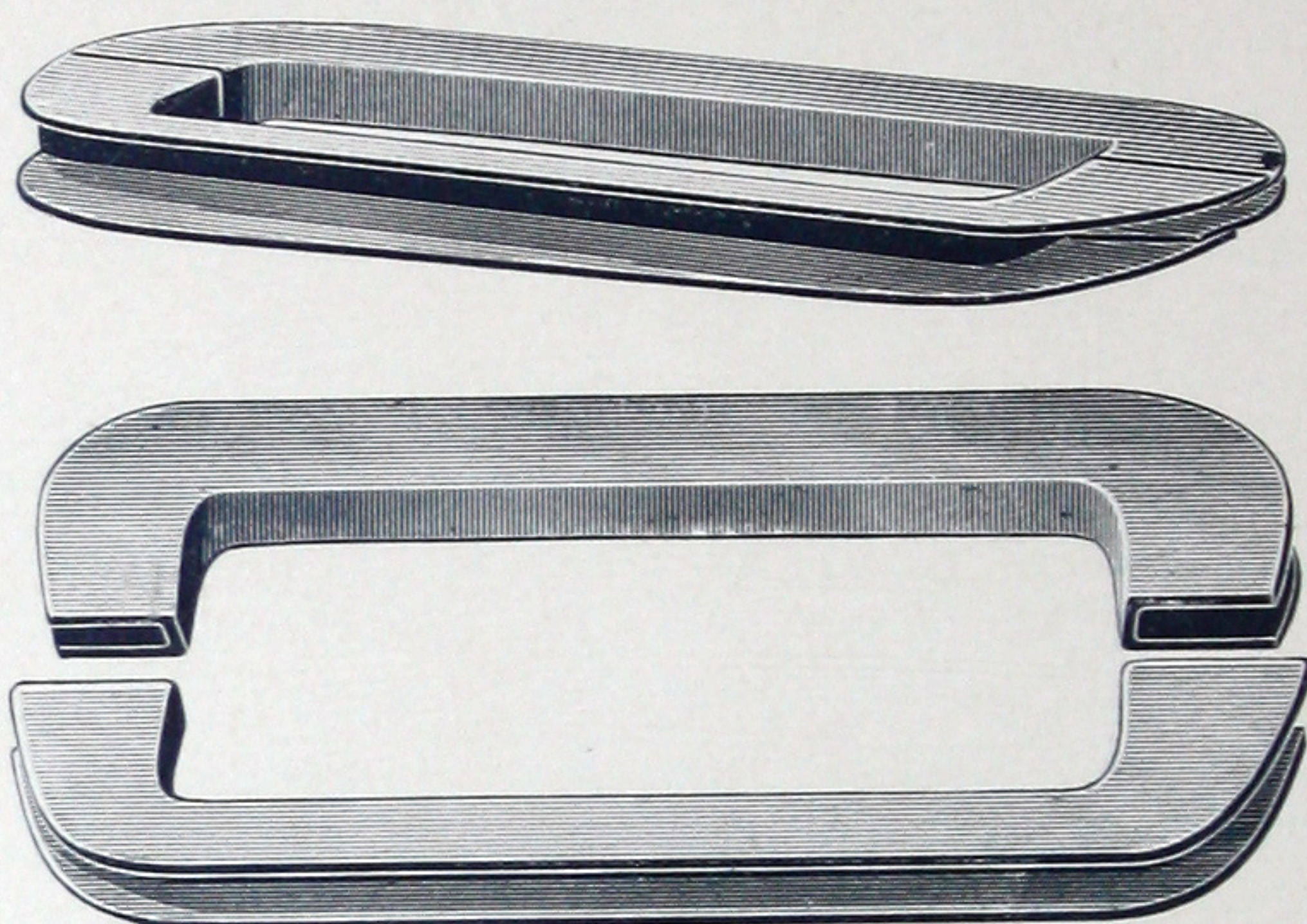
(PATENTED.)

In transmission of signals with high tension currents and railway signalling, a Micanite spool on which is wound the exciting coils for the magnets, strengthens the insulation at this point of the circuit, where it so often breaks down from line discharges. In all cases special moulds for making Micanite spools are required. These we make at cost for our customers.



MICANITE GRAMME RING. ARMATURE SPOOLS.

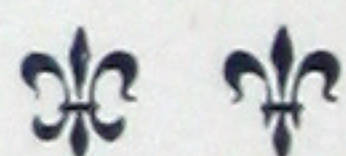
(PATENTED.)



The above spools give an idea of the extent to which a Micanite Plate can be moulded. They are made of pure India Sheet Mica. The two halves fit into each other, and allow the coil to fit snugly on the core.

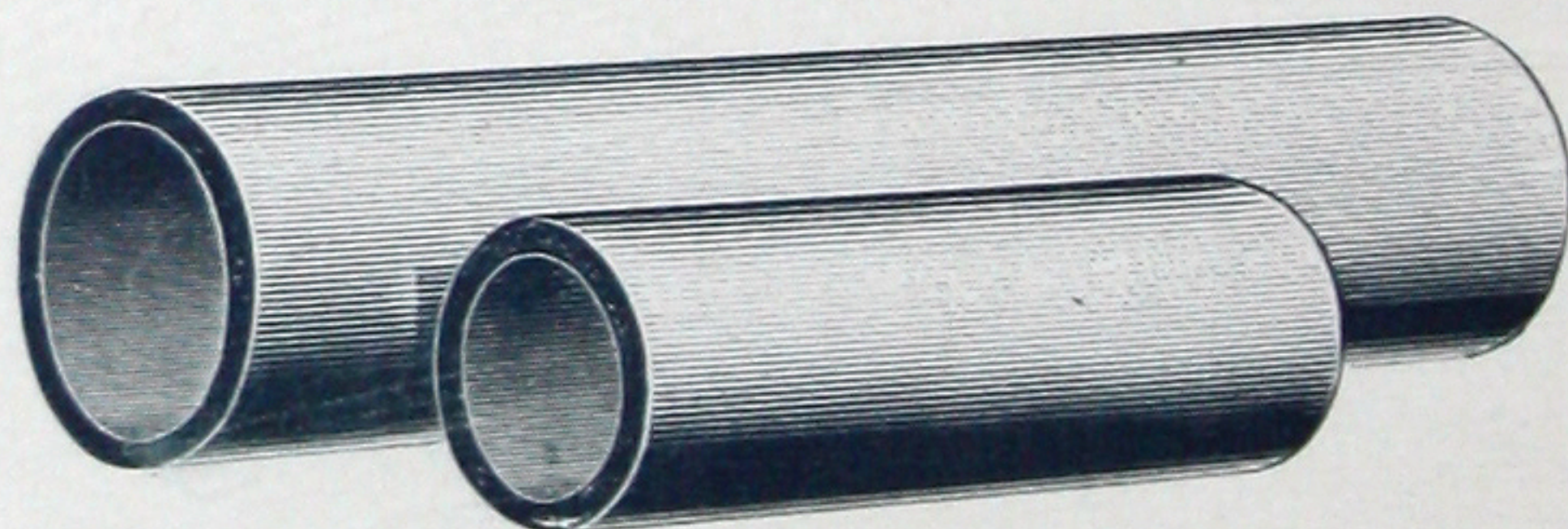
A spool of this form cannot, of course, be made without a mould, and in all such cases we charge for the mould no more than the actual cost.

Estimates furnished upon application.



MICANITE CYLINDERS.

(PATENTED.)

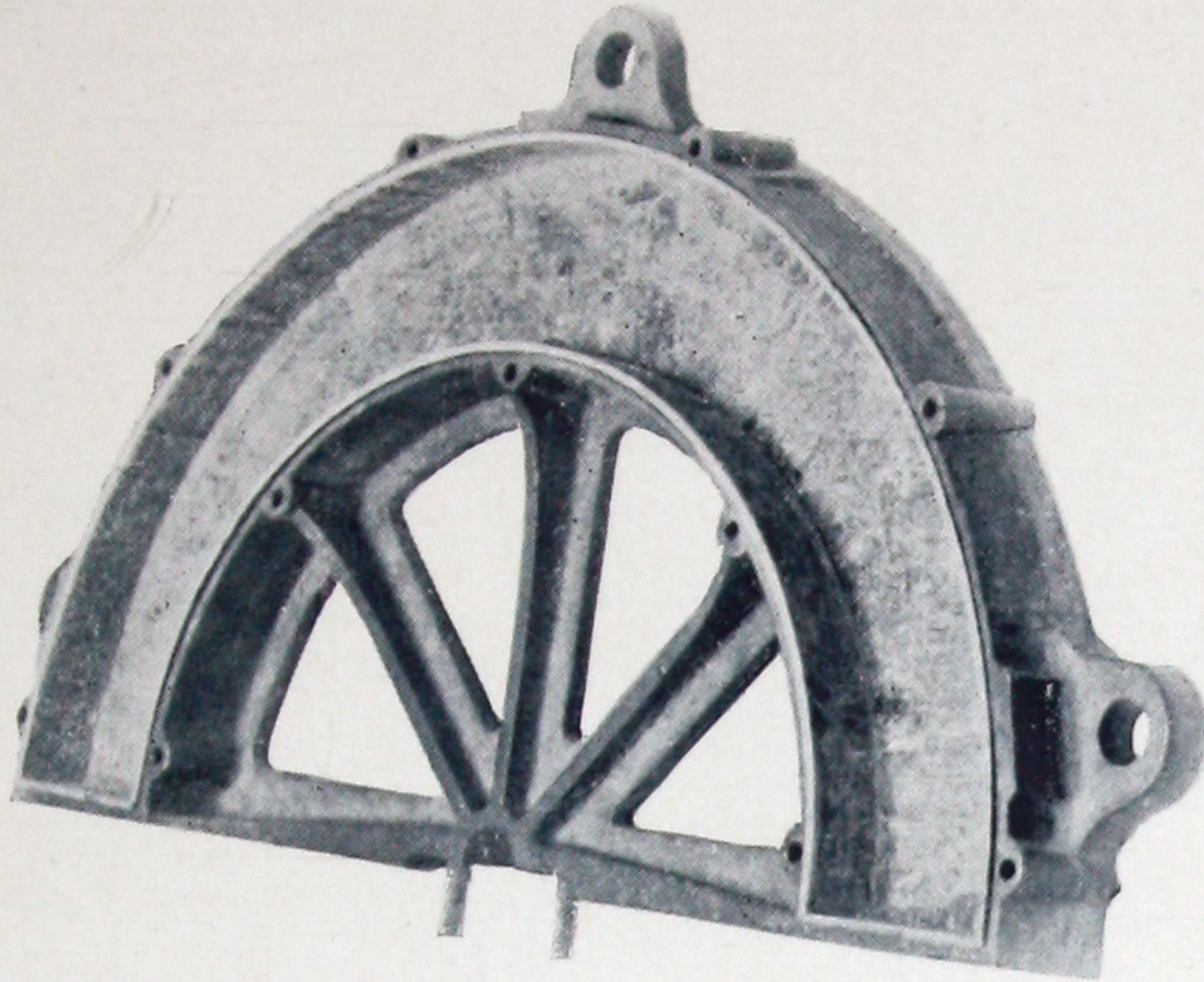


Cylinders for insulating armature bodies and shafts, commutator shells, field cores, etc., we make in all sizes. Our stock of forms is very large and it is rarely we have to make a charge for one.

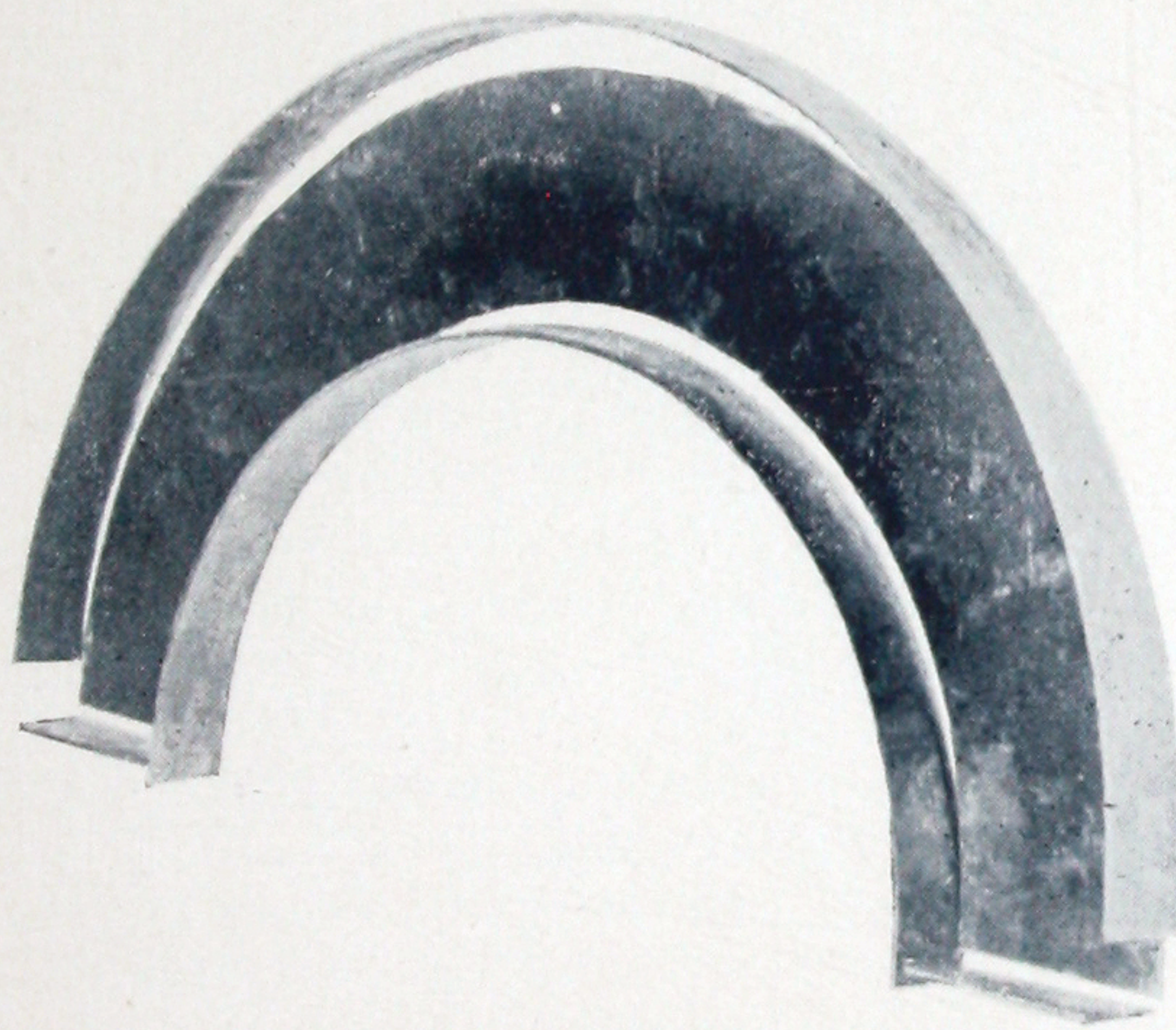
State thickness, internal diameter, and length when ordering.

MICANITE INSULATORS FOR RHEOSTATS.

(PATENTED.)



CUT SHOWING RHEOSTAT BOX LINED WITH MICANITE.



MICANITE LINING READY TO PLACE IN RHEOSTAT BOX.

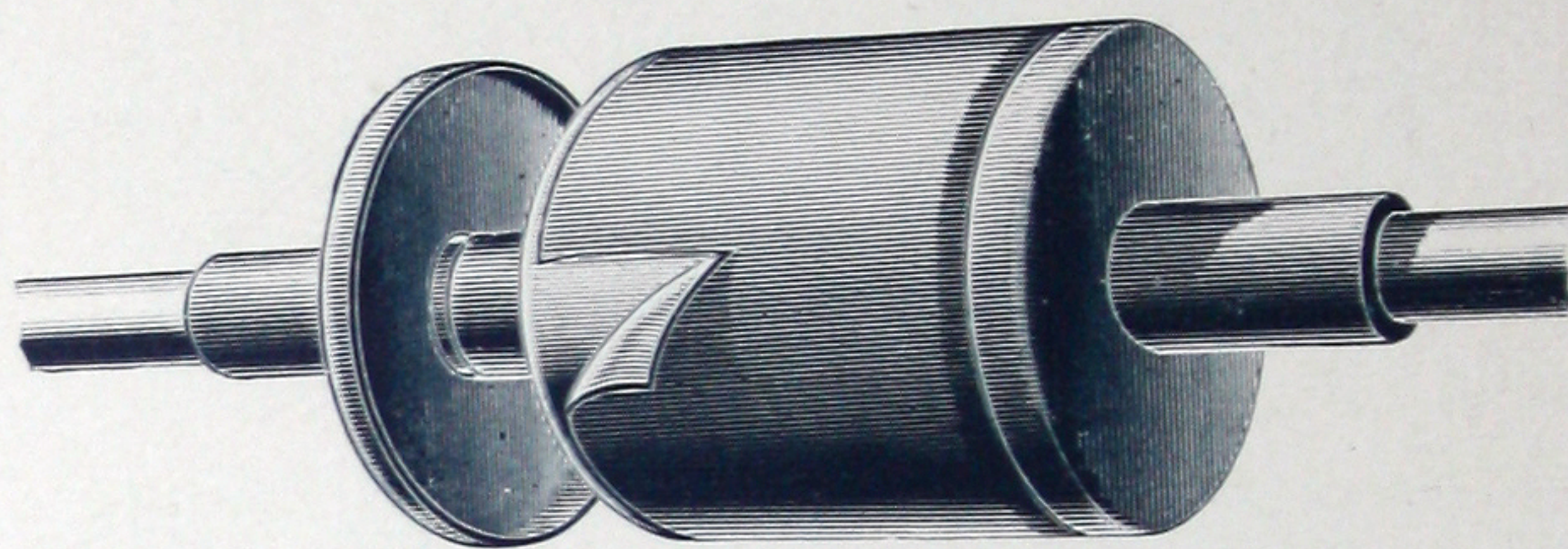
The cuts show the method of insulating street car motor rheostats with Micanite. There is a great saving of labor and material over the clumsy methods hitherto in vogue.

The following types are kept in stock:

Gen'l Elect. Co. Type, 51.	Form D.
“ “ “ “ 52.	“ D.
“ “ “ “ 83.	“ B.

ENTIRE MICANITE INSULATORS. FOR ARMATURES.

(PATENTED.)



(See also cut on page 39.)

The two Armature Cores shown by the cuts are insulated throughout with Micanite, making on them an indestructible heat proof and water proof insulation.

The Drum Armature has two flanged discs at the ends moulded out of Micanite, and the core and shaft surrounded with two cylinders of the same material.

The Slotted Ring Armature (see page 39) has two flanged annular Micanite discs at the ends, moulded Micanite pieces on the inside of the ring and Micanite troughs between the teeth. The edges of the mouldings overlap each other.

These Armatures, thus insulated, have been tested with ten thousand volts alternating current without breaking down.

They mark a great step in advance in the history of dynamo and motor insulation.

We are prepared to design and supply complete Micanite insulations for any type of Armature.



W. P. 50 Armature Core showing application of Micanite Slot Insulators, and annular flanged Micanite Head.

See description on page 38.

ENTIRE MICANITE INSULATORS.

(PATENTED.)

MICA INSULATOR CO.,

CHAS W. JEFFERSON, Mgr.:

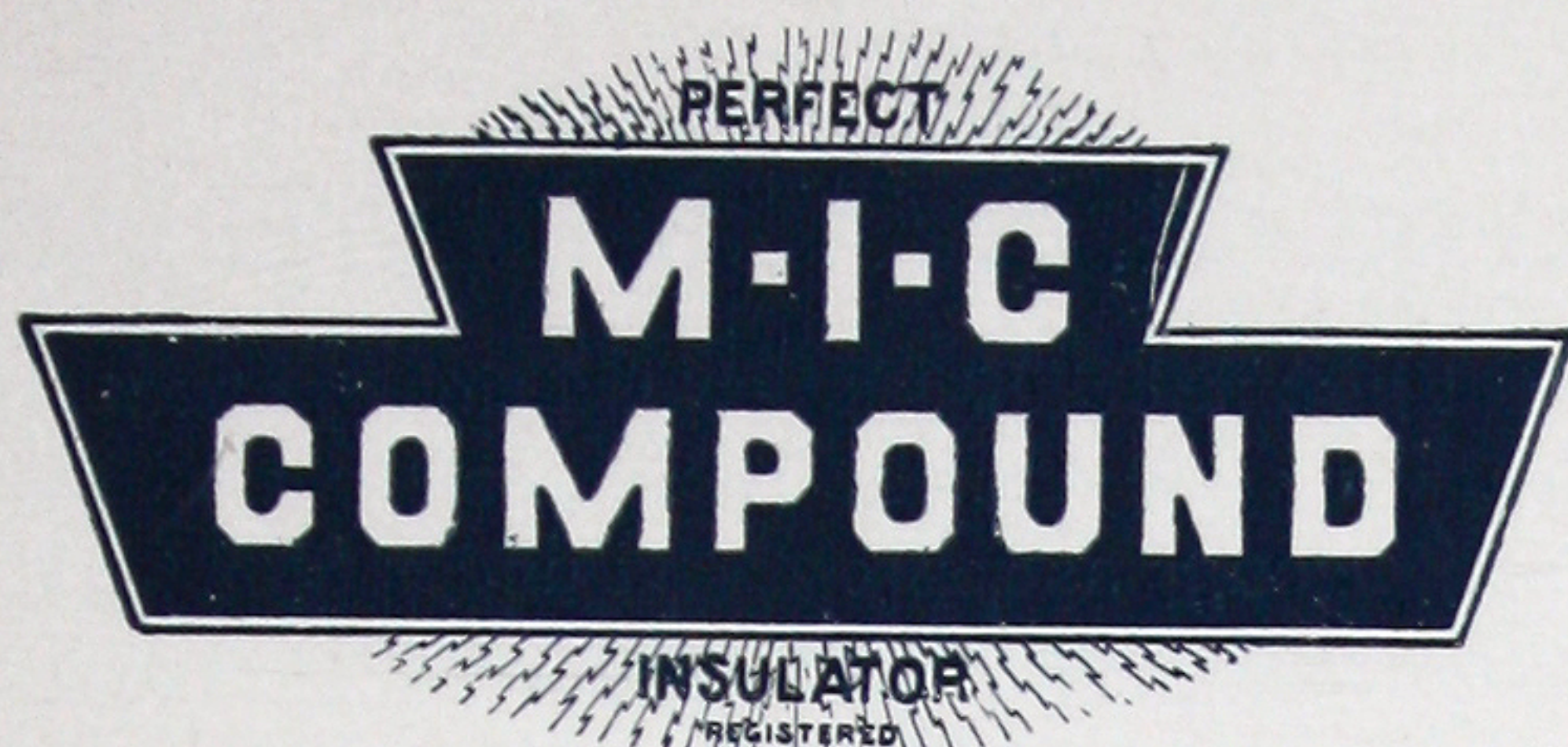
In March, 1894, you put a full body and slot insulation of Micanite on one of our Edison No. 16 street car armatures, and the same was wound at once and put in service, and has been pretty steadily running ever since, the car having made over 50,000 miles. The armature has never given us any trouble in 'body grounds' since it started, although it is of the 'ring' type, and is not protected by the motor frame, it being open to snow, slush or water from the wheels. The wiring on this armature has just been burned out by a severe and continued overload, so heavy as to not only char the insulation of the wire, but to melt some of the wires themselves. On stripping off the wires we were surprised to find the insulation of body and slots in apparently good order, and after fully stripping and testing, we find it absolutely perfect, mechanically and electrically, and are now rewinding it, having done nothing to the insulation but to give it a coat of varnish and bake it. We consider this so remarkable a record that we think it only justice to you to inform you of it. While the full Micanite body insulation costs several times more than our previous method, the results in freedom from armature 'body grounds,' and the ability to re-use the insulation indefinitely, are points that will make us consider the use of Micanite as essential in all our work for the future.

Yours very truly,

SCHENECTADY RAILWAY CO.,

H. S. COOPER, Supt.

Dec. 21, 1896.



WE CALL THE ATTENTION OF THE TRADE to this product, chiefly one of refined linseed oil, asphalt and rubber, with a character that has taken several years to form.

M. I. C. COMPOUND is an enamel; black in color. Each grade is perfect as an insulator, wet or dry; durable, elastic, even after baking. Does not contain carbon-bisulphide or any other objectionable materials. Non-corrosive, stands high temperature, impervious to moisture, no offensive odor, full body; can be reduced to any desired density of solution with turpentine or benzine. **Price very low.**

FOR THE INSULATIONS AND COATINGS of all parts of Motors, Generators, Armatures, Field Magnets, Wires, Cables, Transformers, Overhead Line Constructions, Arc Lamps, Switch Boards, All-bare metal surfaces, and on Cloth, Paper, Fuller Board, etc., it has no equal.

MANUFACTURERS of every variety of Electrical Apparatus, Railway, Telegraph, Telephone, Electric Light and Electric Power Companies, require a high grade article of this kind, and after the most exhaustive tests and trials, we, without hesitation, place it before them and stake our reputation upon it.

M. I. C. COMPOUND, No. 1—Full Rubber, Baking. For Armature Coils, Field Magnet Coils, Wires and Cables, Transformers, for Covering Cloth, Paper, Asbestos, Hard Fibre, and wherever the highest insulation and protection from moisture is required. Air dries in six hours. Bakes hard but elastic, at 300° F. in 8 hours.

M. I. C. COMPOUND, No. 2—Half Rubber, Baking. For all out-door work; Generators, Motors, Arc Lamps, Overhead Line Constructions, Boilers, Smoke-Stacks, etc. Air dries in six hours. Bakes hard, but elastic at 300° F. in 8 hours.

M. I. C. COMPOUND, No. 3—Full rubber, Air Drying; Dust dry in one hour.

M. I. C. COMPOUND, No. 4—Half Rubber, Air Drying; Dust dry in half an hour.

EMPIRE INSULATING MATERIALS.

"Empire" insulating materials comprise various papers and fabrics coated with linseed oil—a very old insulator, but one never before brought to such a high state of efficiency as represented under the word "Empire". The raw papers and fabrics are made specially for us. They have been developed at great expense. The oil is purified by our own process and all deleterious matter is removed. The papers and cloths are exhausted of all moisture before being coated, and the two coats of oil are so distributed over both surfaces as to present an equal thickness on every part. The insulating value is given on page 15.

"EMPIRE" OILED PAPERS.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Manilla Rope Paper	36" x 72"	$\frac{4.12}{1000}$
Bond Paper	19" x 24"	$\frac{5}{1000}$
" "	22" x 34"	$\frac{5}{1000}$

"EMPIRE" OILED CLOTHS.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
No. 1 Muslin	36" x 72"	$\frac{7}{1000}$
No. 2 "	" "	$\frac{5}{1000}$
No. 3 Canvas	" "	$\frac{15}{1000}$

No. 2 is of the same quality as No. 1, but is $\frac{1}{1000}$ of an inch thinner. The thickness of oil is the same on both.

No. 3 is a light specially made canvas and has three coats of oil.

"EMPIRE" OILED LINEN.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Irish Linen, best quality	36" x 72"	$\frac{6}{1000}$

"EMPIRE" OILED ASBESTOS PAPER.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Pure Asbestos Paper	36" x 72"	$\frac{9}{1000}$

M. I. C. COMPOUND INSULATING MATERIALS.

"M. I. C." Compound Insulating Materials are made from the same papers and fabrics that form the base of the "Empire" materials. In the place of the oil they are coated with M. I. C. Compound. This compound is composed of refined linseed oil, Cuban asphalt and rubber.

"M. I. C." COMPOUND PAPERS.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Manilla Rope Paper	36" x 72"	$\frac{4.12}{1000}$
Bond Paper	19" x 24"	$\frac{5}{1000}$
" "	22" x 34"	$\frac{5}{1000}$

"M. I. C." COMPOUND CLOTHS.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
No. 1 Muslin	36" x 72"	$\frac{7}{1000}$
No. 2 "	" "	$\frac{5}{1000}$
No. 3 "	" "	$\frac{15}{1000}$

"M. I. C." COMPOUND LINEN.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Irish Linen, (special quality)	36" x 72"	$\frac{5}{1000}$

"M. I. C." COMPOUND ASBESTOS PAPER.

GRADE OF STOCK.	SIZE OF SHEETS.	THICKNESS.
Pure Asbestos Paper	36" x 72"	$\frac{9}{1000}$

THE VITAL IMPORTANCE OF ARMATURE INSULATION.

[EDITORIAL FROM "THE ELECTRICAL ENGINEER."]

Without armature insulation we should have no current. The armature in the dynamo is the heart of the electric distribution service of to-day, and any defect in it must react on the entire external system. How to maintain the normal, continuous working of this heart, or electrical pump, if we may be allowed to carry out the analogy, is a subject which has very properly claimed the serious attention of dynamo builders from the start. Aside from mechanical considerations, it was soon learned that the insulation of the armature must be maintained intact if trouble is to be avoided; and if this was observed early in the art with low tension direct current machines, how much more must it be considered a vital factor in these days of high tension alternating currents. It was well, therefore, that the subject was brought to the attention of electrical engineers. We believe that it is now generally conceded that for purposes of armature insulation there is nothing which approaches Mica, but its expense has thus far prohibited its use, except in commutator work and in high tension alternating machines. The search for a true substitute for Mica has thus far met with as little success, comparatively, as that long continued quest for a substitute for platinum in incandescent lamps. But where nature has been chary in her supply, man's ingenuity has come to the aid of the dynamo builder by utilizing what had heretofore been a waste product. The product, Micanite, described by Mr. E. P. Thompson, [before the American Institute of Electrical Engineers], appears to have all the properties of its original constituent, and will no doubt prove a valuable adjunct to the materials of electrical engineering.

ESTABLISHED 1840



HEADQUARTERS

FOR _____

ELECTRICAL MICA



Long Distance Phone

Eugene Munsell & Co.

NEW YORK

218 Water Street

CHICAGO

117 Lake Street

Miners, Importers and Wholesale Dealers.

MICA India and Amber.

CUT AND UNCUT.

Stamped Solid Sheet Mica Segments for
any size Commutator Bar.

Sheet Mica selected to cut Specified Sizes.
Washers, Rheostat, etc.

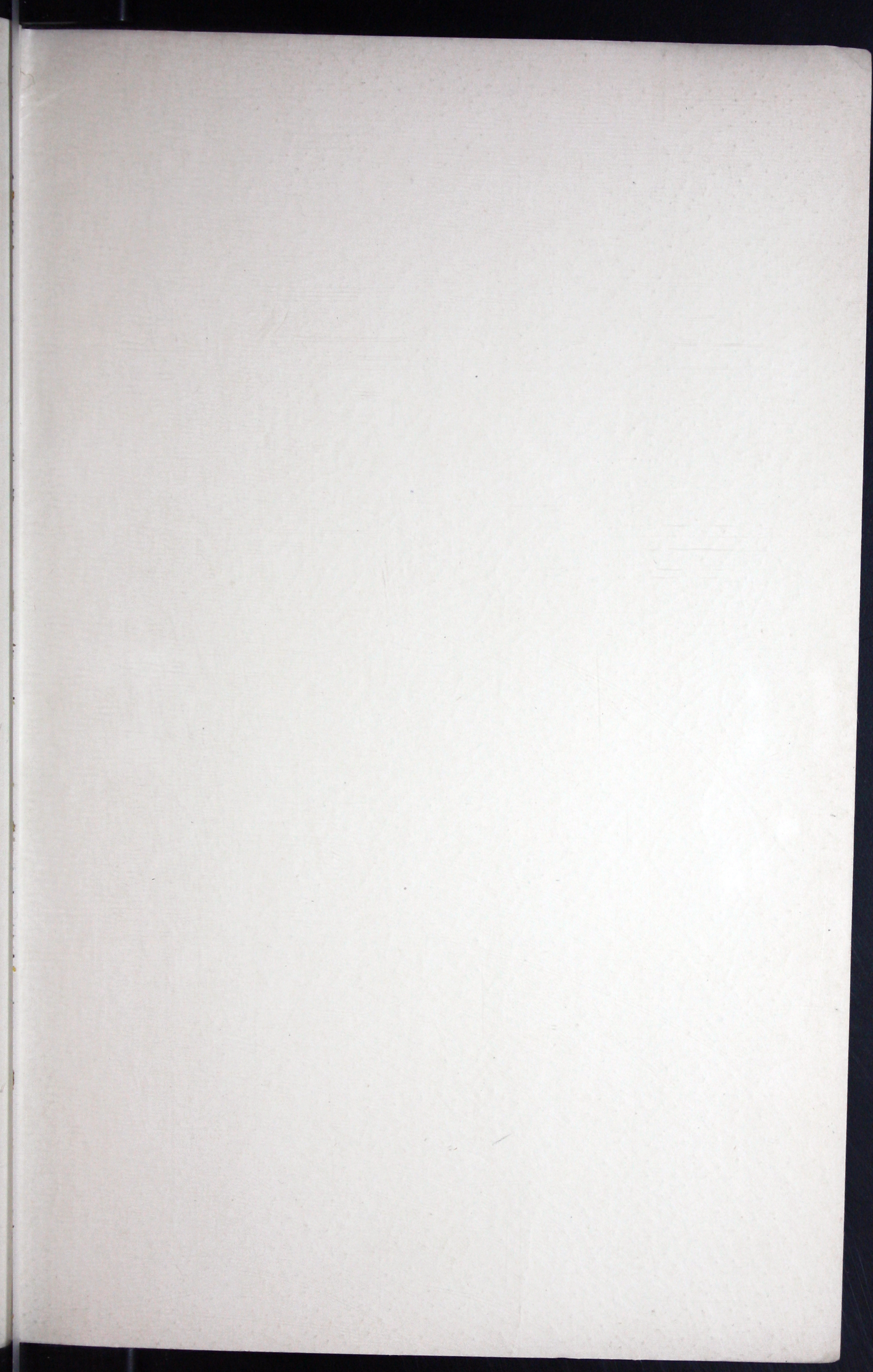
Built-up Mica Segments, Washers and
Rings, any pattern or size, gauged
to thickness ready for use.

GROUND MICA.

All grades of Mica for every purpose.

The rapid growth of our business
is the strongest evidence of the
superiority of our Mica

Samples and Quotations Furnished on Application.



MICANITE
PERFECT
INSULATOR
REGISTERED.

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